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The Clinically Suspect Pelvis and its Radiographical Investigation in 1,000 Cases

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THIS investigation was begun in the spring of 1938 and closed early in 1944, when 1,000 radiographs had been obtained. The object was to examine by X-rays the pelves of women when clinical examination in late pregnancy or history of previous dystocia presaged abnormal labour.

These women were nearly all delivered in this Unit, so that the prognosis of labour made from the radiographs was able to be checked against the outcome of the pregnancy. In only 14 cases were the patients delivered elsewhere, and the mode of delivery is known.

The investigation was confined to women with the following conditions:

1. Evidence of pelvic contraction obtained by clinical pelvimetry.

2. Cephalopelvic disproportion—non-engagement of the head at term in primigravidae.

3. Malpresentation of the foetus, including persistent or recurrent breech presentation in primigravidae.

4. Clinical evidence or history of bony disease affecting pelvis, spine or hips.

5. Previous prolonged labour or operative delivery (other than extraction by low forceps) especially when resulting in stillbirth, neonatal death, or gross injury to mother or child.

During these 6 years, just over 10,000 women were delivered here, 94.8 per cent were delivered spontaneously or by forceps applied to the after coming foetal head. It will be seen, therefore, that there was an obvious overlap, anxiety triumphing over acumen to the "wasting" of some X-ray plates. The overlap, however, occurred to nearly the same extent in the opposite direction, for, included in these 1,000 cases, are some women who were X-rayed during the second pregnancy under our care, following unpredicted disaster at the first delivery.

PROCEDURE.

In the earlier cases a very complete radiographic picture of the pelvis was obtained by a combination of the Thoms, Caldwell-Moloy, Roberts and Rowden methods. Stereoscopic views of the anteroposterior aspect were studied in the Caldwell-Moloy precision stereoscope; by these means or the Thoms method of a superimposed grid; or, in the lateral projection, by the simul-

taneous exposure of an upright metal rod notched in centimetres and inches, both the shape and the size of the cardinal diameters of the pelvis became manifest. By the careful examination of these nearly 300 plates, the writer became familiar with the obstetrical possibilities of the various types of pelvis, so that when the national necessity to economize in imported materials arose and increased, it was possible to be content with an anteroposterior view of the pelvic brim and a lateral projection, and lately, often, with a lateral projection only. From the first, women were selected for radiography nearly always in the last 2 weeks of pregnancy so that the old dictum "the foetal head is the best pelvimeter" could be realized. As time went on, the conviction was reached and maintained of the importance of the shape rather than the size of the pelvis as a guide to prognosis and conduct of labour. Thus, normal delivery has been achieved with a simple flat pelvis with a true conjugate of the brim of exactly 3.3 inches, and Caesarean section found necessary with android pelves of a 4.5 inches conjugate. The developed plates were examined by the writer in all cases and a forecast of labour made. As each woman was admitted for delivery, the plates were displayed in the labour suite for guidance and teaching if operation or manipulation became necessary. So, not only were the obstetricians comforted when dealing with difficult or doubtful cases, but the strategy and tactics of the nice conduct of obstetric manoeuvres were clearly illustrated for watching students. With increasing experience, it became possible to forecast the course and nature of labour and delivery very accurately indeed from the shape of the pelvis, the relative position of the foetal head, and, always, a study of the maternal powers—mental and physical—to endure the proposed travail. It may be argued at this point, that these latter factors of labour are so important as to make even the most careful radiographic forecast haphazard or approximate only. We do not agree, for the comparison of prognosis and outcome in this large series shows that the incidence of error has been very low. A survey of the bony structures of the birth canal and its passenger evaluates the few factors than can be measured with any scientific accuracy, and it is hoped to show that it should form at least the basis on which "suspect" cases may be safely treated.

Incidence of Various Pelvic Types.

The 1,000 pelves have been grouped morphologically according to the Caldwell-Moloy classification. It is felt that, not only is this classification more widely known in this country than is Thoms', but that it conveys more vividly the characteristics of each type and the probable associated mechanism of labour rather than simply the relative diameters of the brim. One exception has been made, the writer has substituted "pithecoid" for the so-called "anthropoid" type in order to convey fitly the sense "ape-like" that the original misnomer could not when applied to a description of the human pelvis. The Thoms classification terms "dolichopellic" and "platypellic" are the complements of the anthropoid (pithecoid) and platypelloid of Caldwell and Moloy; but the term "mesatipellic" (the transverse diameter of the brim is equal to or slightly greater, not more than 1 cm., than the anteroposterior diameter), although generally identifiable with the gynaecoid, gives no indication of the position of the greatest transverse diameter and may therefore cover the android brim as well; the term "brachypellic" (the transverse diameter is more than 1 and less than 3 cm. greater than the anteroposterior diameter) may cover both android and gynaecoid shapes. The Thoms

terminology, too, does not give an instant impression of the whole pelvis or allow the description of intermediate types outside the 4 parent types as in the Caldwell-Moloy scheme.

TABLE I.

Gynaecoid	348
Gynaecoid-android	110
Android	203
Android-gynaecoid	251
Pithecoid	64
Platypelloid	18
Pathological types:	
Rickety flat	5
Osteomalacia	1
Total	1000

CLINICAL RELATIONSHIPS.

1. *Body Build.*

It is tempting to try to draw an association between pelvic type and physical appearance. Observers such as Michaelis thought that stature alone is no indicator of pelvic width, nor does the width of the hip region bear any relation to the size of the bony pelvis. Dean Swift remarked on the fecundity of the plump and well-shaped woman with neat ankles; Sterne and Defoe advised the selection of such a type for satisfactory marriage. Caldwell and Moloy suggest a marked correlation of physical and pelvic type; they illustrate the philosophers' observations by their description of the physical type associated with the gynaecoid pelvis as having narrow sloping shoulders, slender waist, the hips rounding from waist to knee, the legs and ankles slim. They also fortify the aesthetic aversion to the thickset woman with thighs running straight down to thick ankles by linking her to the android pelvis, and Thoms finds his brachypellic type of pelvis to be associated with this body build. In this they are supported by Fischberg and others who associate this high-coloured, short-necked female type with the dystocia-dystrophia syndrome. Caldwell and Thoms agree that the possessors of pithecoid (anthropoid-dolichopellic) pelves are predominantly tall, long-headed and wide-shouldered, with narrow flanks and (Caldwell) long slender limbs.

This is a short analysis of only 532 cases in my series in which a clear description of the woman's appearance has been available from the clinical record.

Thirty-eight women with pithecoid pelves were all noted to be tall, 31 were of typically pithecoid (anthropoid) appearance, and 7, gynaecoid. Pelvis and body build conformed in 81.6 per cent.

The 118 women with android pelves were remarked as of android type in 92 cases, in 26 of medium to short but gynaecoid appearance; giving a conformation rate of 78 per cent.

The 233 women with gynaecoid pelves were tall and gynaecoid in appearance in 138 cases, short or medium and gynaecoid in 13 cases—151 in all, conforming 67.7 per cent. The rest were pithecoid 45, android 27.

The intermediate pelvic forms were also of some interest for the large android-gynaecoid group of 106 were predominantly android in appearance—86, with 8 medium and 12 short gynaecoid women. The gynaecoid-android group of 43 pelves were possessed by 38 medium or short gynaecoid and 5 android women. The only 4 platypelloid pelves were all associated with short women, the tallest being 5 feet 3 inches, and the smallest, 4 feet 10 inches in height.

It would seem from these figures that there is, at least in this selected group, a fairly marked conformity between physical form and pelvic type. The figures can be usefully examined from another standpoint. In none of these cases was radiography of the pelvis done because of the body build. Of the 532 picked because the physical type was recorded, a total of 210

women are said to have been of android appearance—39.4 per cent of the numbers available. This rather high proportion may be explained by the fact that, as shall be seen, women of this type underwent admission to hospital for other investigations or treatment that involved the taking of a full case history more often than any other type. If, however, these 210 women had been selected for radiography because of their suggestive physical type only, 92 android pelves would have been discovered, and 86 android-gynaecoid, with only 27 gynaecoid and 5 gynaecoid-android pelves. It will be shown later that, thus, 178 pelves (android and android-gynaecoid) with a high operative delivery rate would have been found and the investigation could have been useful as a guide to the conduct of labour in 85 per cent of cases.

2. *Race.*

Only 2 coloured women are included in this series—1 Indian with advanced osteomalacia and a mulatto with healed Pott's disease and rickets causing a grotesque degree of spinal and pelvic deformity. A total of 317 women of the Jewish faith or "race" have been delivered in this Unit during the period of this investigation. Forty-eight of these were examined by X-rays on the grounds of previous dystocia (prolonged labour or operative delivery), or gross obesity making determination of the foetal position or external version of a malpresentation impossible, and external and internal pelvimetry unreliable. It is obvious that so small a number of cases cannot be considered representative, although 48/317 or 15.5 per cent is rather a higher proportion of this group than the 1,000 pelves described here form in proportion to the total 10,197 deliveries taking place during the relevant period. However, every one of the 48 Jewish women had a pelvis of a perfect gynaecoid type. This, often, despite the frequent association with such physical characteristics in the possessor as obese, stocky build, hirsutes, hypertension, or other features associated with the dystrophia-dystocia syndrome. The operative aid required at the delivery of the whole 317 was Caesarean section 1 (for apparent disproportion in an obese 3-para radiography was not available here and a hydrocephalic child was thus unfortunately delivered alive); low forceps 4. There were not any maternal deaths.

American investigators, such as Caldwell and Moloy, who in New York must deal with a nearly 30 per cent Jewish population, have not assorted their many thousands of pelves racially among the "whites." It would be interesting to know if the above findings are borne out by any large series of radiographs of the pelves of pregnant women in a Jewish hospital.

3. *Case History.*

It has been possible in the present circumstances to obtain a more or less complete personal and family history of only 548 women of the 1,000. This information has been related to the pelvic type in the following table (II). Menstrual disorders include painful, irregular, infrequent or scanty periods or late menarche. Infertility is here defined as being present in women who are involuntary sterile for 3 or more years or who suffer from the abortion habit. It is seen that women of the android and android-gynaecoid groups show the most personal and familial dysfunction if the small number of their siblings can be taken to suggest that the pelvic form may be inherited. In succeeding paragraphs on the infant pelvis the possibility of this is indicated.

4. *Rickets and Osteomalacia.*

Clinical and radiographical evidence of rickets was encountered only 5 times.

Although the women attending this Unit are predominantly Londoners, rickets was found but once in a London bred patient aged 48, bearing after long widowhood, her first child by her second husband. The other 4 were young women from the "depressed" areas of the North, Clydeside, South Wales and Ireland. The woman from South Wales has already been referred to as a mulatto with spinal tuberculosis. She was nevertheless able to bear spontaneously a 6 pound child, the C.V. of the brim was 3.4 inches. There is gained a strong impression that rickets is virtually absent in the present childbearing generation in the London area. The great majority of the women examined here come from the semi-skilled and artisan strata of the population; under 10 per cent are unmarried; severe malnutrition is uncommon; a fairly good wage level is reflected in the generally high standard of neatness and cleanliness of mothers and babies, and, especially in the under thirty age group, by the good state of the teeth. The other 4 rachitics were delivered by Caesarean section. The solitary case of osteomalacia has been fully described in another journal. It was discovered in a young Indian woman who seemed to have developed it during the 6 years of her residence in this country, her condition being brought about by poor feeding and by living in conditions which are known to favour the development of the disease in her countrywomen at home, that is, in a dark room secluded from light and fresh air. The two children of this woman were found to have foetal rickets, the others' babies were normal at birth.

TABLE II.

Pelvic type		Menarche average age, years	Menstrual disorders, per cent	Infertility, per cent	Siblings average number	Average age at 1st grav. years
Gynaecoid	226	13½	4.4	7	4	23.4
Gynaec-android	64	13	4.7	4	3.8	23.8
Android	103	15	15.6	31.6	0.9	29.5
Andro-gynaecoid	119	14½	18.0	23	1.2	27
Pithecoid	31	13	5.6	5.8	3.9	21.2
Platypelloid	5	14	0	0	—	24
Total	548					

5. *Toxaemias of Pregnancy.*

This term includes patients with hypertension, oedema or albuminuria in the latter months of pregnancy. The attempt has not been made to sort these into the categories, essential hypertension, chronic nephritis and "true" toxaemia of pregnancy. However, on the clinical findings, the cases have been divided into "mild" and "severe"—"mild" indicates a slight, or marked but transitory degree of the familiar signs and symptoms; "severe" includes the recurrent, persistent or acute forms of the disease including accidental antepartum haemorrhage and eclampsia. The table below shows the incidence of the mild and severe forms of the disease in relation to the various pelvic types. Taking the gynaecoid pelvis as unity, it is seen that the possessors of android pelves are more than 12 times more likely to develop the mild and 8 times more probably the severe forms of toxaemia. The male hind pelvis shows its sinister potentialities here, too, for it is evident that the android-gynaecoid group develop mild toxaemia 9 times, and the severe form, 5 times more often than the gynaecoid. The 7

fatal cases of eclampsia recorded among over 10,000 deliveries fell, in the 5 cases in which the pelvic form was known (either before or after the conclusion), 3 times in the android-gynaecoid group, and once each in the android and gynaecoid groups. The well-known association of severe toxaemia of pregnancy and puerperal morbidity is also well shown in a successive paragraph to afflict the women in these 2 masculine groups, especially.

TABLE III.

Showing Incidence per cent of Toxaemia of Pregnancy.

	Gynaecoid	Gynaecoid-android	Android	Android-gynaecoid	Pithecoid	Platypelloid
Mild ...	4.4	5.0	52.6	40.3	5.1	7.2
Severe ...	3.6	5.9	25.9	17.4	0.0	5.5

6. *Puerperal Morbidity and Mortality.*

The incidence of puerperal morbidity is low in this Unit, 23.9 per thousand among 10,197 women, and there were only 28 cases of notifiable fever among the 1,000 of this series. The figure is highest in the android and android-gynaecoid groups which together account for 64 per cent of the total, or 18 febrile cases out of 454 in these two groups. This morbidity occurred even in women of these groups treated by elective Caesarean section; apart from these, the relatively high sepsis rate must be attributed to the more frequent occurrence of factors that always contribute to the development of infection—foetal malpresentation, early rupture of the membranes, prolonged labour, manipulative or instrumental delivery. The only 2 maternal deaths of the series occurred in these two masculine groups. One, android-gynaecoid primigravida died of "shock" after prolonged labour and the application of the forceps; the other died of pulmonary embolus after operation and is referred to in detail elsewhere. (See Figs. 1 and 2, also under "Infant Pelvis.") She had an elective Caesarean section performed for android pelvis and toxaemia. Hysterectomy had to be done for intractable haemorrhage due to inertia. She was obese, hypertensive and infertile; 2 of her siblings suffer from dysmenorrhoea and infertility; 1, the only brother, has undescended testicles.

The remaining 10 cases of infection were scattered evenly among the other pelvic types save the pithecoid group, in which there were none.

7. *Pelvic Arthropathy.*

During the examination and re-examination of these 1,000 radiographs and of many scores of others, taken for reasons without the scope of this investigation, those pelves were noted in which the degree of separation of the pelvic rami at the symphysis was unusually wide, or when the radiograph had been taken to discover the cause of pain over the sacroiliac or pubic region in pregnancy or the puerperium; 302 such plates were studied from a miscellaneous collection. It was found that the non-symptomatic and symptomatic incidence of the wide separation was highest in the gynaecoid and gynaecoid-android groups, low in the masculine groups and encountered only once in a pithecoid pelvis. The gynaecoid and gynaecoid-android pelves showed the condition 241 times (gynaecoid 162), android 12, android-gynaecoid 38, pithecoid 1, platypelloid 10.

It seems possible that the relative instability of the average female as compared to the average male pelvis may be made more manifest in pregnancy in pelves with markedly female characteristics, while the more compact, solid and stable male-type pelves may be more resistant to the causal hormones, or the possessors may be defective producers of such hormones. All the patients whose marked and painful pelvic instability made admission to hospital necessary had good gynaecoid pelves. One of these women welcomed even the pains of labour as relief from the intolerable backache she suffered in the latter weeks of each pregnancy. She had a large gynaecoid pelvis and bore spontaneously many large babies.

Prognosis and Event.

As stated under "Procedure," each radiogram was scrutinized by the writer and a forecast of the probable nature of labour made, with notes of advice for the guidance of the obstetrician. In all the cases in which a trial of labour or other project would call for good powers of mental or physical endurance, the patient was also assessed clinically by the writer or a senior colleague. The co-operation of the nursing and resident staffs made it possible to keep closely in touch with the course of labour in all cases and to gain experience in the correlation of radiographically revealed anomalies of the bony pelvis and other factors of labour. A random selection of specimens of prognosis and event read as follows:

Gynaecoid-android pelvis; head poorly flexed; left occipito posterior, engaged. Low forceps. If rotation does not occur spontaneously extract as occipito posterior.

Result: Spontaneous slow rotation to occipito anterior. Low forceps, episiotomy. Child, 7 pounds 6 ounces.

Android-gynaecoid pelvis; straight sacrum, bad hind pelvis throughout; left occipito transverse. Mid forceps. Rotate to occipito anterior.

Result: Midpelvic arrest in occipito transverse. Manual rotation to occipito anterior. Forceps. Child, 6½ pounds (Figs. 4 and 5).

Android-gynaecoid pelvis; left sacro anterior; infertile 1-gravida, aged 31. Elective Caesarean section.

Result: Caesarean section. Child, 8 pounds.

Large android pelvis; right occipito transverse; young 2-gravida (previous Caesarean section. Child, 7½ pounds). Trial of labour, mid forceps.

Result: Mid forceps after manual rotation to occipito anterior. Child, 7½ pounds.

Platypelloid pelvis; occipito transverse; engaged; expect long 1st stage. Low forceps.

Result: (1) Outlet forceps. Child, 7 pounds 11 ounces. (2) Spontaneous delivery. Child, 7½ pounds.

Pithecoid pelvis; unengaged head; left occipito transverse. Normal labour in occipito posterior or occipito anterior. (Patient had been advised Caesarean section elsewhere for cephalopelvic disproportion). (Fig. 6).

Result: Spontaneous delivery in occipito posterior. Child, 9¾ pounds.

Platypelloid pelvis; right occipito transverse; well flexed unengaged head. Trial; probably normal delivery or low forceps.

Result: Early rupture of membranes, deflexion of head; Caesarean section. Child, 7 pounds.

From this sample it may be seen that the radiological prognosis may sometimes be over-sanguine and occasionally underestimate the pelvic capacity. However, with increasing experience in the method, the prognoses became extraordinarily accurate with, now, errors of underestimation still cropping up but very rarely those of unwarranted optimism. Thus, in the first year of the investigation covering 198 cases, the prognosis and event differed widely 10 times—resulting in 3 Caesarean sections when mid forceps were predicted, 3 mid forceps when spontaneous delivery was foretold, and in 4 cases when trial of labour —probably Caesarean section was forboded, 1 spontaneous delivery and 3 mid

forceps extractions took place without harm to mother or child. In the last 12 months covering 213 cases, the incidence of error has dropped to 4 over-pessimistic forecasts of the "trial of labour probably Caesarean section intervene early" type made on the X-ray and clinical examination of elderly 1-gravidae resulted in 1 spontaneous delivery, 2 mid forceps extraction of mature living babies and 1 outlet forceps. As the results in each group are discussed in detail in the succeeding paragraphs, it may be sufficient to assess the accuracy that may be obtained with care and experience in the following words: "There is an obvious mechanism of labour for each pelvic type. If the pelvic type is known, and the other factors of labour are taken into account, gross error of prognosis does not occur, or at the worst, errors of over-pessimism" (Caldwell).

(a) *Gynaecoid.*

The largest group uncovered was the gynaecoid, the commonest type in fertile women of all classes and the one least often associated with dystocia. It may therefore be suggested that the ordinary clinical examination of pelvic capacity should have been sufficient in this large group, but a scrutiny of the reasons why radiography was considered necessary is interesting

The 348 such women could be classified then, thus:

	Total	P	M
1. Persistent or recurrent malpresentation, including breech (in primigravida), face, brow ...	88	82	6
2. Previous operative delivery (other than low forceps) prolonged labour with stillbirth or neonatal death	142	0	142
3. Non-engagement of the head at term (in primigravida) ...	118	118	0
	348	200	148

Primigravidae.

In this group the primigravidae numbered 200. Of these, 192 were delivered at term (child $5\frac{1}{2}$ pounds or over) with operative intervention 28 times. An analysis of this intervention shows the following measures:

A. *Caesarean section* (6):
- Small pelvis, child 9 pounds or over ... 2
- Persistent breech, elderly, 1-grav. 1
- Brow presentation in labour 1
- Transverse lie ("Flying foetus") 2

B. *Mid Forceps* (10).
- Small pelvis, child 8 pounds or over 4
- Prolonged labour (occiput anterior) 2
- Prolonged labour (occiput posterior) ... 3
- Persistent face presentation 1

C. *Low forceps* (12):
- Prolonged labour (occiput anterior) ... 8
- Rheumatic heart disease 1
- Recent repair of perineal laceration ... 3

The remaining 8 primigravidae were delivered before term or of babies weighing less than $5\frac{1}{2}$ pounds, thus:

A. *Spontaneous* (7).

B. *Caesarean section* (1).
(Central placenta praevia).

Multiparae.

Of the 148 multiparous women, 142 were delivered at term (child $5\frac{1}{2}$ pounds or over) with operative intervention 16 times, thus:

A. *Caesarean section* (7):
- Previous classical section for malpresentation, placenta praevia 3
- Rupture of previous classical scar in labour 1
- Central placenta praevia 1
- Concealed accidental antepartum haemorrhage 1
- Child $11\frac{1}{2}$ pounds (breech presentation) ... 1

B. *Low Forceps* (9):
- Rheumatic heart disease 4
- Inertia (hydramnios; twins) 2
- Face presentation 1
- Recent repair of perineal laceration 2

The remaining 6, 2 of whom had had previous lower uterine segment Caesarean

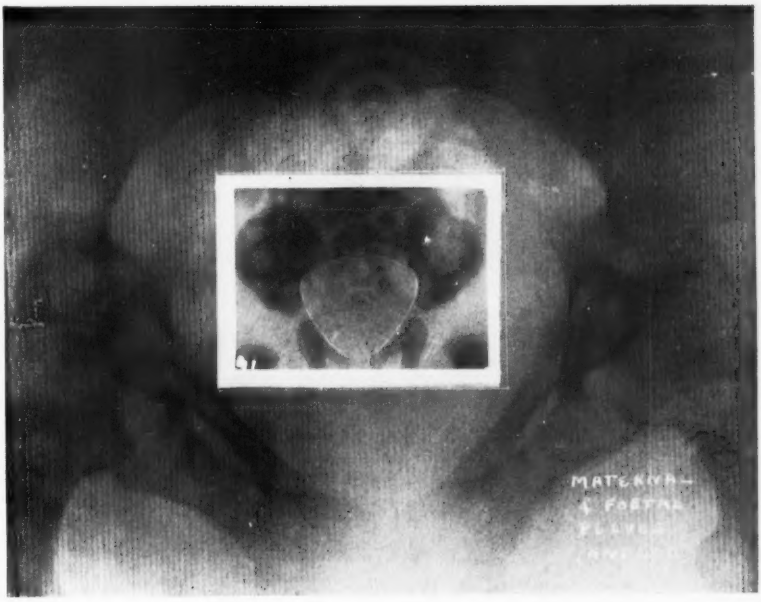

FIG. 1.

Maternal and Infant Pelvis (android).

M.K.

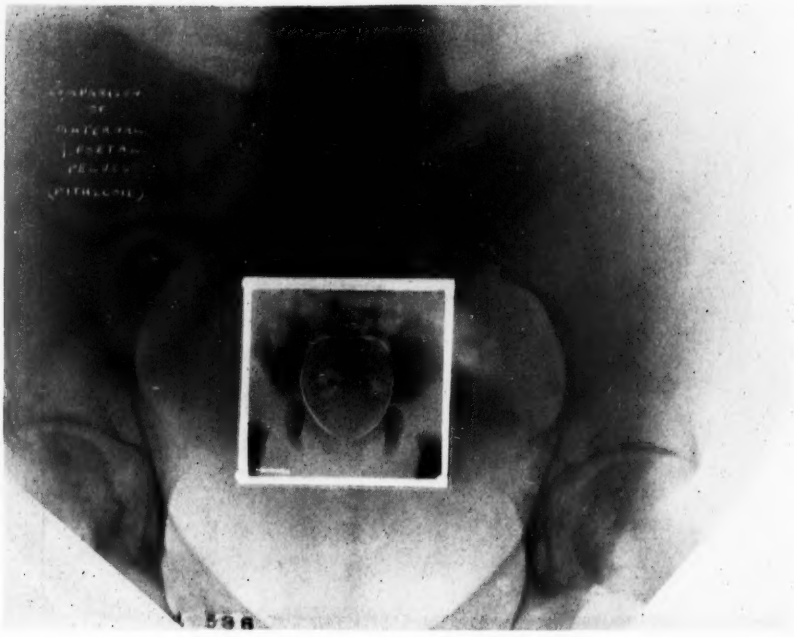

FIG. 2.

Maternal and Infant Pelvis (pithecoid).

FIG. 3.

Gynaecoid-android Pelvis.

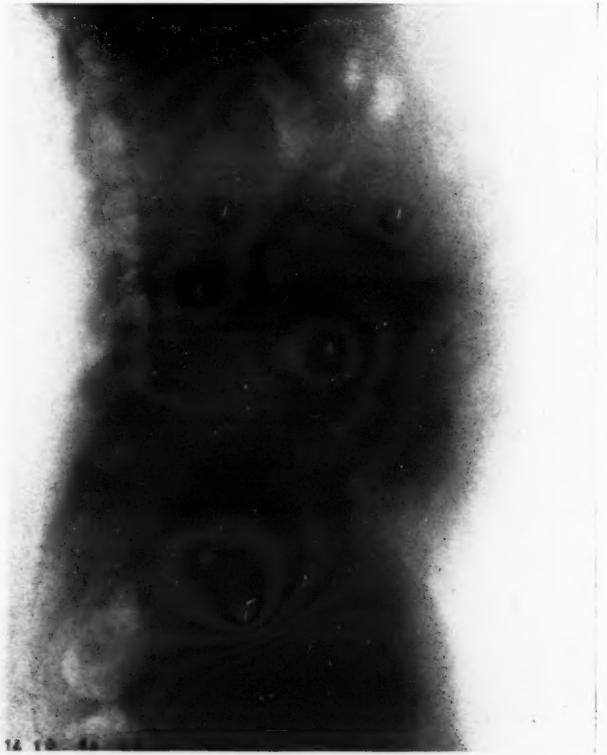

FIG. 4.

Android-gynaecoid Pelvis.

FIG. 5.

Android-gynaecoid Pelvis.

FIG. 6.

Pithecoid Pelvis.

section, and 1 repair of a vesicovaginal fistula caused by the inept use of Kjelland's forceps, were delivered spontaneously of immature living babies.

Thus the operative interference rate in this group is:

Primigravidae	(29 in 200)	14.5 per cent
Multiparae	(16 in 148)	10.8 per cent

Total average 12.9 per cent.

A corrected rate, excluding operation done for other reasons than pelvic incapacity, e.g., rheumatic heart disease, placenta praevia, toxaemia or previous classical section performed for unknown or insufficient cause, gives the following percentages:

Primigravidae	(24 in 200)	12.0 per cent
Multiparae	(2 in 148)	1.3 per cent

Average 7.4 per cent.

Omitting low forceps, the rate per cent is:

Primigravidae	(17 in 200)	8.5 per cent
Multiparae	(7 in 148)	4.7 per cent

Average 6.8 per cent.

(b) *Gynaecoid-android.*

A group of 110. Radiography was employed to discover these pelves for the following reasons:

	Total	P.	M.
1. Persistent or recurrent malpresentation	65	62	3
2. Cephalo-pelvic disproportion ...	31	31	0
3. Previous operative delivery or prolonged labour with stillbirth or neonatal death ...	14	0	14
	110	93	17

Primigravidae numbering 93. Of these all were delivered of mature babies and required operative interference to achieve this 16 times, thus:

A. *Caesarean section* (6):
- Central placenta praevia 3
- Breech; mother 41 1
- Small pelvis, child 8 pounds or over 2

B. *Mid forceps* (2):
- Prolonged labour; occiput anterior 2

C. *Low forceps* (8):
- Prolonged labour; occiput anterior 5
- Eclampsia 1
- Rheumatic heart disease 2

Multiparae numbering 17. Three had spontaneous delivery of immature and 8 of mature babies. Six required operative delivery:

A. *Caesarean section* (2):
- Child 9 pounds; deflexed head 1
- Breech; central placenta praevia 1

B. *Low forceps* (4):
- Persistent occiput posterior 2
- Prolonged labour; occiput anterior ... ... 2.

Thus in this group the operative interference rate is

Primigravidae	(16 in 93)	17.2 per cent
Multiparae	(6 in 17)	35.3 per cent
	22 in 110	20.0 per cent

Excluding operation done for other reasons than pelvic incapacity the corrected rate is

Primigravidae	(10 in 93)	9.3 per cent
Multiparae	(5 in 17)	29.5 per cent
	15 in 110	13.6 per cent

Excluding low forceps

Primigravidae	(8 in 93)	8.6 per cent
Multiparae	(2 in 17)	11.8 per cent
	10 in 110	11.0 per cent

(c) *Android.*

This group included 203 pelves or 20.3 per cent of the total. This is a high incidence of the true male pelvis but it must be remembered that this 1,000 are "suspect" pelves and in no single case of unforeseen disaster among the remaining 9,000-odd women delivered on this service was this type of pelvis discovered *post hoc*. The

actual incidence may therefore be assumed to be rather under 3 per cent among fertile women in this area.

The reasons for radiography in this group were as follows:

	Total	P.	M.
1. Malpresentation of foetus ...	34	32	2
2. Previous operative delivery (other than low forceps), prolonged labour with stillbirth or neonatal death	68	0	68
3. Clinical evidence of pelvic contraction	34	34	0
4. Cephalopelvic disproportion ...	67	62	5
	203	128	75

Primigravidae.

These numbered 128. Operative intervention was required 108 times to effect the delivery of mature infants. Of the rest, 11 mature babies were delivered spontaneously as also 9 immature. Analysis of the operative aid shows:

A. *Caesarean section* (46):
- Disproportion, failed trial of labour 28
- Disproportion, no trial of labour 12
- Malpresentation 6

B. *Mid forceps* (48):
- Persistent occipito-posterior 16
- Midpelvic arrest in occipito-transverse ... 28
- Prolonged labour, occiput anterior 14

C. *Low forceps* (14):
- Prolonged labour, occiput anterior 4

Mulliparae.

These numbered 75, and of them 12 mature and 4 immature babies were born naturally. The remaining 59 women were delivered of mature children, thus:

A. *Caesarean section* (20):
Previous stillbirth or neonatal death after:
- (*a*) Breech delivery 3
- (*b*) Craniotomy 5
- (*c*) Forceps 8
- (*d*) Prolonged labour 4

B. *Mid forceps* (22):
- Persistent occipito posterior 12
- Midpelvic arrest in occipito transverse ... 8
- Prolonged labour, occiput anterior 2

C. *Low forceps* (17):
- Prolonged labour, occiput posterior 17

Thus, of the 145 Caesarean sections performed on all the 1,000 patients of this series, 66 were on women with android pelves purely for reasons of pelvic inadequacy. The operative interference rate is

Primigravidae (108 in 128) 84.3 per cent
Multiparae (59 in 75) 78.6 per cent

Omitting low forceps, the rate is

Primigravidae (94 in 128) 73.0 per cent
Multiparae (42 in 75) 56.0 per cent

(d) *Android-gynaecoid.*

Comprising 251 cases and having a sinister obstetric significance only second to the android group. This pelvis is rather difficult to detect clinically. The group was discovered for the following reasons:

	Total	P.	M.
1. Malpresentation of foetus ...	38	28	10
2. Previous operative delivery, prolonged labour with stillbirth or neonatal death	136	0	136
3. Cephalopelvic disproportion ...	77	77	0
	251	105	146

Primigravidae.

These numbered 105. Eighteen were delivered spontaneously of mature and 8 of immature children. Seventy-nine required operative assistance:

A. *Caesarean section* (25):
- Failed trial of labour 11
- Breech; mother over 35 10
- Severe toxaemia; disproportion 4

B. *Mid forceps* (38):
- Midpelvic arrest in occipito-transverse ... 22
- Prolonged labour; occipito-posterior ... 13
- Prolonged labour; occipito-anterior ... 3

C. *Low forceps* (16):
- Prolonged labour; occipito-anterior ... 16

Multiparae.

Numbering 146. Twenty-one were delivered spontaneously of immature children, 5 of mature stillborn children with some degree of maceration, 6 of mature living children. The remaining 114 required operative aid:

A. *Caesarean section* (24):
- Failed trial of labour 13
- Previous craniotomy 3
- Previous instrument delivery with stillbirth 8

B. *Mid forceps* (68):
- Prolonged labour; occipito-anterior 36
- Prolonged labour; occipito-posterior ... 28
- Prolapsed cord 4

C. *Low forceps* (22):
- Prolonged labour; occipito-anterior 11
- Prolonged labour; occipito-posterior ... 10
- Prolapsed cord 1

Operative interference rate per cent:

Primigravidae	(79 in 105)	=	75.2
Multiparae	(114 in 146)	=	78.0

Excluding low forceps:

Primigravidae	(63 in 105)	=	60.0 per cent
Multiparae	(92 in 146)	=	63.1 per cent

(e) *Pithecoid* (Anthropoid, dolichopellic).

This is a small but interesting group. This type of pelvis is usually easily recognizable clinically and rarely gives rise to suspicion of its capacity for normal passage of the foetus. It was found in only 64 women of the series and the reasons why radiological investigation was considered necessary are as follows:

	Total	P.	M.
1. Previous operative delivery (other than low forceps)			
Caesarean section, elective or after trial	4		
Premature induction for "disproportion"	6		
Mid forceps for persistent occipito posterior (2 stillbirths)	3		
Carried forward...	13	0	13
Brought forward	13	0	13
2. Persistent breech presentation in primigravidae	28	28	0
3. Non-engagement of head at term in primigravidae	23	23	0
	64	51	13

Primigravidae, 51.

Of these 51, 42 were delivered at term without operative interference beyond that required for the extraction with forceps of the aftercoming head in 7 cases. Seven other mature babies were delivered by low forceps in the occipito posterior position; 2 immature babies were born easily after induction of labour for toxaemia and lateral placenta praevia respectively.

Multiparae, 13.

Despite the fact that 4 of these women had had a previous Caesarean section, they and 8 others had deliveries of spontaneous mature babies. The remaining one had a Caesarean section at the 38th week in an attempt to obtain a living child after 7 previous very short labours resulting in the stillbirth of children weighing 9½ to 14 pounds. A seemingly healthy 8½ pound baby was delivered thus but died in 18 hours of causes undiscoverable at autopsy.

The operative interference rate is therefore:

Primigravidae	(7 in 51)	13.7 per cent
Multiparae	(1 in 13)	7.7 per cent
	Average	15.7 per cent.

Omitting low forceps the rate is 1 in 51 or 2 per cent.

(f) *Platypelloid.*

The smallest group was the platypelloid or simple flat pelvis comprising only 18 cases. Five of the women had spontaneous deliveries of mature children. Three had

Caesarean section for the delivery of children of $5\frac{1}{2}$, 6 or $7\frac{1}{4}$ pounds respectively. Two of these women have had 3 Caesarean sections each performed by the writer and resulting in the birth of babies weighing 1 to $1\frac{3}{8}$ pounds more than the first each time. Not any of these patients have as yet desired to be sterilized. The section in each case was in the lower uterine segment. Six of the others have had mid forceps at term for 5 mature and one $5\frac{1}{4}$ pound child. In 2 of these, the delivery was accomplished very easily with the aid of the Barton forceps, an instrument especially designed to extract the head lying in the mid pelvis in the transverse diameter. Three had low forceps for mature livebirths and 1 gave birth spontaneously to a 7 pound child stillborn with erythroblastosis foetalis. Rickets did not appear to play any part in the flattening of the pelvis in this group. The smallest anteroposterior diameter of the brim recorded was 3.3 inches with a transverse of 4.9; the largest was 3.8, with a transverse of 5.1. The operative interference rate was thus 12 in 18, or 66 per cent.

Although, outside the pelves recorded here, there is the small number which for one reason or another was not "suspect" antenatally, and yet the women concerned experienced dystocia; postpartum radiography carried out in just under 90 per cent of these women (as a guide to the conduct of their future delivery) did not ever reveal the platypelloid pelvis. Yet, allowing for the fact that 5 in 18 discovered platypelloid pelves were compatible with spontaneous delivery of mature children, it may be assumed that this type of pelvis must be more common than is suspected clinically before or at delivery, or discovered radiologically. We have no figures of the incidence of this type of pelvis in "basic" or unselected fertile women in Southern England, and there is too wide a discrepancy between the 1 per cent "white" incidence in New York of Caldwell and Moloy and the 4 to 6.7 per cent of Thoms and Greulich in New Haven, for their figures to be of any use to us in this country. The Thoms figures, in any case, represent women delivered of mature babies only. The Thoms and Greulich figures refer separately to the pelves of 100 white nulliparous nurses, and among these there were not any platypelloid pelves, a fact attributed by these investigators to the probable adequate diet in early childhood obtaining in the group. It seems fair to suggest an incidence of about 2 per cent for this type in the area under consideration, in about one half of whom, operative delivery may become necessary.

TABLE IV.

Operative Interference Rate per cent in Various Pelvic Types.

	Total operative incidence	Excluding low forceps	Excluding other factors	Caesarean section
Gynaecoid	12.9	6.8	7.4	3.7
Gynaecoid-android	20.0	9.0	13.6	4.5
Android	82.5	67.0	82.5	34.9
Android-gynaecoid	76.4	61.7	76.4	15.5
Pithecoid	15.7	2.0	10.9	1.6
Platypelloid	66.0	50.0	66.0	16.6
Pathological types	80.0	—	—	—

A Comparison of Clinical and Radiographical Methods for Estimating Pelvic Capacity

The information gained from external measurements made at the antenatal clinic was usually negligible. The relation of the interspinous to the intercristal diameters may be of interest in rachitic pelves, but the great rarity of this condition in the London area has made the taking of these measurements perfunctory. In only 1 of the 5 patients with rickets, discovered here in 6 years, was the normal relation of these 2 diameters reversed. Small external measurements have been found in both small and adequate pelves and large measurements in both small and large pelves. The external conjugate is significant only when shortened—when of normal length, it may be completely misleading as a guide to pelvic capacity. Thus, in the small platypelloid group of 18 cases, the external conjugate was in one instance $7\frac{3}{4}$ inches and in another, $6\frac{1}{2}$ inches. The other 16 were described as between $7\frac{1}{2}$ and 8 inches. There was no constant relation between the radiographical and clinical measurement of the conjugata vera calculated thus. However, in the 5 rachitic pelves, the external conjugate was in every case under $7\frac{1}{2}$ inches. Wide and quite insignificant variations in length were found in pelves of other types.

Internal measurements of the pelvis must be made by an experienced obstetrician with the greatest care to be reliable, and the conjugata vera calculated from it by the deduction of an amount varying with the sagacity of the observer. Even with the laxity of the parts obtaining at the 36th week of pregnancy, the sacral promontory may not be easily reached in the primigravida. In more than 80 per cent of the 1,000 cases here reviewed it was noted that the promontory was not reached, and as shown by radiography, a false impression of pelvic adequacy at the brim might thus have been gained in many cases. In 34 cases in which the promontory was reached, the calculated measurement of the conjugata vera was 96 per cent erroneous when compared with the radiographical estimation. The clinical measurement in each case was too small, in 3 cases by 1 inch or more. The writer is of the opinion that the routine pelvic examination carried out *per vaginam* in late pregnancy is more valuable for eliciting other information about the pelvis than for its most popularly avowed purpose, the estimation of the diagonal conjugate. The prominence of the ischial spines, the measurement of the posterior sagittal diameter of the midpelvis, the conformation of the sacrum and coccyx and the width of subpubic angle and intertuberous diameter are more accurately estimable. In other words, the foetal head remains the best clinically available measure of the brim, it is the lower reaches of the pelvis that require careful vaginal palpation, and X-ray exploration in cases of doubt. The examiners' attention in this Unit is always directed importantly to the conformation of the sacrum and the posterior sagittal diameter of the midpelvis. From an examination of the detailed report of the incidence of operative interference in the various types of pelvis it will be seen that the android hind pelvis plays the most sinister part in the causation of dystocia. Thus, however generous the diameters of the brim, if the transverse diameter is displaced towards the sacral promontory, the anterior surface of the sacrum flattened or convex from side to side, the posterior sagittal diameter of the midpelvis shortened by the narrowness of the sciatic notch and the straightness of the sacrum, radiological investigation of the pelvis is considered most necessary. Although it is important to try to assess the intertuberous diameter

and the width of the subpubic angle, we have found a far smaller incidence of operative delivery when the fore pelvis is narrowed and the hind pelvis adequate, as in the gynaecoid-android pelvis.

The Infant Pelvis.

It may be wondered whether the pelvic type is determined *in utero* or in the growing years. Sexual differences in the foetal pelvis have been known to exist for many years; recent observers, such as Thoms, find the pithecoid (dolichopellic) type more common in young girls than in adults of the same class, but also commoner in "privileged" class women than in the "underprivileged," and therefore suggests a nutritional factor in the determination of the adult pelvic form. In general, it has been supposed that the foetal pelvis adheres more or less to the transversely contracted or pithecoid type, and that endocrinal or nutritional factors alter its form in the growing years. Inspired by a single clear radiographic view of the pelvis of a foetus *in utero* which showed a remarkable similarity to that of its mother (pithecoid—the baby was a girl in the event), the writer obtained X-ray views of the pelvic brim of female infants born of mothers of known pelvic type. The necessity for economy in these days has severely limited the extent of this inquiry; only 20 such little girls have been examined. Thirteen of these babies had pelves of exactly the same type as their mothers; the remaining 7 were pithecoid, their mothers gynaecoid or mixed types. Two striking samples are pictured in Figs. 1 and 2. Ten newborn boys were also examined—9 had true male pelves, 1 was of a somewhat female type. It would seem, from this very small series, that there may be a mother-daughter affinity of pelvic form. (Fig. 2). It especially tempts one to misquote Wilde as "women are born like their mothers, that is their tragedy" This mother was delivered by Caesarean section; hysterectomy had to be done for postpartum haemorrhage, and as described before, she died of pulmonary embolism. Her infertility and that of her family has been described under "toxaemia of pregnancy" and "morbidity."

I cannot find elsewhere this notice of a mother-daughter pelvic likeness and urge its pursuance in a far larger number of cases in countries free from our patriotic necessity to economise.

If a constant affinity can be shown in an adequate and significant number of examples, the matter is of extraordinary interest when taken in relation to Table II, showing the fertility of the present and nearest past generation of the women misshapen with android pelves.

Discussion.

In 6 years, during which 10,197 women have been delivered in this Unit, 1,000 radiographs of the pelvis during pregnancy were made on suspicion of future, or knowledge of past dystocia. These radiographs were studied and a forecast of the nature of labour to be expected and a guide to its conduct were made after assessing as well the other factors concerned as far as possible. The shape of the pelvis was considered rather than its size although the various cardinal diameters were usually measured and borne in mind. During this time, 520 operative deliveries were carried out. The 1,000 radiographs cover the greater number of these and so can fairly be said to represent the whole of the abnormal pelves dealt with in these years. The exceptions occurred when operative intervention took place in emergencies for placenta praevia, sudden foetal or maternal distress. Thus, of 178 Caesarean sections performed, 145 were on women of the "suspect" group of 1,000—the remaining 33,

for various reasons, on women with adequate pelves. Of 342 forceps deliveries, 307 (including all mid forceps) are represented here, the remainder were all outlet forceps only. Of 164 primigravid breech deliveries resulting in 136 live births and 28 stillbirths or neonatal deaths (25 immature and 3 mature children), all but 4 of the maternal pelves had been X-rayed. The 1 death of a mature child of a mother whose pelvis was thus known to be adequate was due to infection (harelip and cleft palate).

Turning to the possible saving of life and health, maternal and foetal, the picture is interesting. There were 2 maternal deaths in this group of 1,000 women, 1 woman with an android pelvis died of pulmonary embolism following Caesarean hysterectomy; 1 died of "shock" during the application of mid forceps (android-gynaecoid) at the end of a long labour. Gross laceration of the birth canal was avoided entirely, and, apart from the high rate prevailing in the android and android gynaecoid groups, the morbidity rate was 2 per cent lower than the low rate obtaining for all the cases delivered in this time (average 2.39 per cent).

Four hundred and twenty-five babies have been stillborn or died shortly after birth in this time—35 belonged to mothers of the radiographed group. 12 of these were immature, 16 had congenital abnormalities incompatible with living, 5 died before or during labour of causes undiscoverable at autopsy, 1 died of obstetric trauma, 1 of neonatal infection. It will be seen that the infant loss compares favourably even with the low rate obtaining in all births in the Unit.

The gynaecoid and gynaecoid-android groups show throughout the lowest pathology rate, equalled and sometimes surpassed by the small pithecoid group. This last group comprised almost entirely women of the professional or privileged classes, this agreeing with Thoms' finding of the dolichopellic type most frequently among the well-nourished layer of the population and diverging from the Caldwell-Moloy suggestion of this as a primitive pelvic type undergoing evolution to the flat form in the higher races of mankind.

This teaching school draws postgraduate students from all over the world to learn not the rudiments of the obstetric art, but the recognition and management of the abnormal. Radiography is here of immeasurable value to demonstrate that the pelvis is patently subject to great variations in form as well as in size and that even minor pelvic variations may be important factors in the pathology of labour.

In conclusion, I cannot do better than to quote Thoms' "there is no question that a large proportion of untimely and ill advised obstetrical operations are the direct result of a lack of proper understanding of the mechanical aspects of labour in which variations in the contours and the dimensions of the pelvis may play a major part . . ." and Munro Kerr's "I do not think that, with the knowledge now at hand regarding the influence excited by even minor variations of pelvic formation, we who advocate routine pelvic radiography for all primigravidae have lost our sense of proportion in this matter as many suggest to-day. On the contrary, I make bold to predict that before many years pass it will be accepted as an essential detail of the antenatal examination."

Summary

1. Pelviradiographical examination in late pregnancy was performed in 1,000 women with clinical evidence of contracted pelvis, cephalopelvic disproportion, foetal malpresentation or history of previous dystocia.

2. The various pelvic types in this clini-

cally suspect group are classified and their clinical relation discussed.

3. The nature of labour and delivery is predicted from the radiographs and the outcome is described in each group.

4. A short note on the infant pelvis is added.

5. The use of radiographic methods of estimating pelvic capacity is urged in the interests of mother, child and accoucheur.

Note.

A bibliography is not attached. For the last 20 years obstetricians and radiologists and anthropologists here and notably in the U.S.A. have devoted many important and well-known papers to the classification of pelvic types, the mechanism of labour, and to pelvimetry and pelviradiography in general. The present writer stands gratefully on their wide shoulders. Her greatest debt is owed to the writings and the persons of the late William Caldwell of New York, her kind and first teacher; Howard Moloy, his brilliant young associate; Herbert Thoms of Yale, artist and humanist, an Erasmian of our time; and their colleagues. In a different way, this paper owes much to Leonard Colebrook, who has preached from a bacteriological viewpoint, the need for preventing the preventible trauma of the birth canal. An ordinary acknowledgement of sources would fill more pages than the matter of this contribution. To my colleagues, Major Duncan White, R.A.M.C., and Dr. Eric Topham of the Department of Radiology of the British Postgraduate Medical School, I give my gratitude for their help in this work; and to many of my ex-residents and the Departmental Sister of the Obstetric Unit, Miss Mary Tweddle, for their unfailing patience and co-operation in this long investigation.

Contracted Pelvis in Childbirth: A Study of its Morbid Effects on Mother and Child

The Blair Bell Lecture, 1944*

BY

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I MUST thank you for the honour you have conferred upon me in asking me to give the Blair Bell Memorial Lecture. Twelve years ago Professor Blair Bell was our President and in the Chair at this meeting, and the present King and Queen, as Duke and Duchess of York, honoured us by opening the College.

It was very apparent to all of us who were present on that occasion that our President, Blair Bell, was endowed with unusual personal characteristics of dignity and charm. Moreover there was about him a dynamic force which augured that the ship which was being launched at that time would be in the hands of a brilliant pilot. The years which have intervened since then have proved that the College has justified the early hopes which were entertained for it.

Twelve years ago it happened that the Departmental Committee on Maternal Mortality and Morbidity presented their report to the Government and, among their several recommendations, they suggested that it was necessary to investigate the geographical distribution of contracted pelvis. With the aid of the Medical Research Council I instituted such an investigation in Scotland. Information was elicited from antenatal clinics, from hospitals, and from general practitioners throughout Scotland. The results of this investigation were communicated to the British Congress of Obstetricians and Gynaecologists in Belfast in 1936.[1] It might be of some advantage to recapitulate a few results of this investigation as an introduction and background to the present lecture.

It was found that contracted pelvis existed chiefly in the industrial centres in Scotland where the standard of living was low—in Glasgow, Dundee, in parts of Edinburgh (notably Leith), and to a much lesser extent, in Aberdeen. North of the Caledonian Canal there was, so far as could be ascertained, an entire absence of contracted pelvis. Moreover in the less densely populated agricultural areas, although contracted pelvis did exist, the incidence was so small that the condition did not constitute a practical problem. Again, I was able to show that the incidence of contracted pelvis varied with the incidence of rickets. Where rickets existed, contracted pelvis also abounded. Where rickets was not present, contracted pelvis was virtually absent. It was therefore reasonable to conclude that the problem of contracted pelvis, as it presents itself to Scottish obstetricians is, in the main, the problem of rachitic pelvic contraction.

Caldwell and Moloy[2] have carried out a

* The Lecture was delivered in the Royal College of Obstetricians and Gynaecologists after the Annual General Meeting on April 29th, 1944. This article includes some of the statistical tables upon which the conclusions were based.

most exact investigation into the congenital abnormalities of pelvic morphology. In Scotland this type of abnormality is of secondary practical importance to pelvic contraction due to bony disease. Caldwell and Moloy have been able to classify the congenital abnormalities of the pelvis into various morphological groups. The conventional classification of rachitic pelvis is largely restricted to the flat and generally contracted flat; little attention has been paid to other forms of rachitic pelvic contraction. If rachitic children are capable of developing bowed tibia, bowed femora, or double or single knock knee or a wide variety of deformity as the result of same or similar physical stresses, it is only reasonable to suppose that the pelvis will show an equally wide variety of deformity and, indeed, this is the case. While flattening of the pelvis is the most common deformity produced by rickets it is by no means uncommon to find the pelvis distorted in the oblique diameters or in the plane of least pelvic dimension, or to find the sacrum flattened or the pubic rami distorted. Briefly the rachitic pelvis does not conform to any standard classification. This renders the prognosis in any given case difficult.

When I reported to the Medical Research Council that which I considered to be the distribution of contracted pelvis in Scotland and what forms of contracted pelvis might be encountered, Sir Edward Mellanby suggested that it would be of value to show the toll of maternal and foetal life taken by contracted pelvis. This was the main object of the request by the Departmental Committee that the distribution of contracted pelvis should be investigated.

In order to obtain the desired information I investigated a series of cases from Glasgow Royal Maternity Hospital which deals with a larger number of contracted pelves than any other centre in Britain. This series of 1,049 cases—with most of which I was personally acquainted—were admitted to the hospital over a period of 2 years. They comprised 15 per cent of the total admissions. The series was made up of 560 primigravidae and 489 multiparae. They were divided into 3 groups according to their pelvic measurements; a 'severely contracted' group, in which the true conjugate was $3\frac{1}{4}$ inches or less; a 'moderately contracted' group, in which the true conjugate was less than $3\frac{3}{4}$ inches but more than $3\frac{1}{4}$ inches; and a 'slightly contracted' group, in which the true conjugate was $3\frac{3}{4}$ inches. This conforms in some respects to Litzmann's[3] definitions. Twenty-two per cent of the cases fell into the severely contracted group, 34 per cent were moderately contracted, and 44 per cent slightly contracted. I would like you to take particular note of the last figure, namely, the slightly contracted group of 44 per cent.

Now, this series of hospital cases contained 894 or 85 per cent—a large majority—of what I called "A" cases. They were cases in which treatment had not been prejudiced by outside interference or neglect. They were not necessarily booked cases. The others, 155 or 15 per cent, were cases which had been mishandled or neglected and referred to hospital. They were allotted to category "B."

The percentage of slight cases in the "A" group was 41 per cent, and that in the "B" group was 59 per cent—a difference of 18 per cent with a standard error of 4.3. This shows that there was a preponderance of slight cases in the "B" category and, as the proportion is higher in that category, it is reasonable to assume that they had been missed or that their importance had been underestimated, otherwise they would have been referred at an earlier stage to the hospital. This applied equally to primigravidae and multiparae and will be referred to again.

The detailed tables follow.

TABLE 1.
Total Number of Cases (A and B).

	Severe	Per cent	Moderate	Per cent	Slight	Per cent	Totals
Primigravidae ...	106	**18.9**	185	**33.1**	269	**48.0**	560
Multiparae ...	120	**24.5**	177	**36.2**	192	**39.3**	489
Total ...	226	**21.5**	362	**34.5**	461	**44.0**	1049

TABLE 2.
" A " Cases (894).

	Severe	Per cent	Moderate	Per cent	Slight	Per cent	Totals
Primigravidae ...	98	**20.9**	157	**33.5**	214	**45.6**	469
Multiparae ...	112	**26.4**	157	**36.9**	156	**36.7**	425
Total ...	210	**23.5**	314	**35.1**	370	**41.4**	894

TABLE 3.
" B " Cases (155).

	Severe	Per cent	Moderate	Per cent	Slight	Per cent	Totals
Primigravidae ...	8	**8.8**	28	**30.8**	55	**60.4**	91
Multiparae ...	8	**12.5**	20	**31.3**	36	**56.2**	64
Total ...	16	**10.3**	48	**31.0**	91	**58.7**	155

The total number of "A" and " B " cases in the several categories are tabulated in Tables 2 and 3.

The excess of slight cases in the " B " category for both primigravidae and multiparae are here considered separately and shown in Table Z.

MODE OF DELIVERY

The first question to consider is the manner in which these patients were delivered. Frequently the mode of delivery offers evidence as to the dystocia which was present. The cases are therefore tabulated in Tables 4 to 9 according to the way in which the patients were delivered.

The first column of figures in each group represents the number of cases delivered. The second column of figures in each group (shown in heavier type) represents the percentage of the total.

The severe cases represent 18.9 per cent of the total number of primigravidae, the moderate cases 33.1 per cent, and the slight cases 48 per cent.

The severe cases represent 24.5 per cent of the total number of multiparae, the moderate cases 36.2 per cent, and the slight cases 39.3 per cent.

TABLE Z.

		Severe No.	Severe per cent	Moderate No.	Moderate per cent	Slight No.	Slight per cent	Total
Primigravidae	'A'	98	**21**	157	**33**	214	**46**	469
	'B'	8	**9**	28	**31**	55	**60**	91
Total		106		185		269		560
Difference	'A'–'B'		+12 per cent		+2 per cent		−14 per cent	
		$X^2 = 9.54$.		P less than 0.01.				
		Severe No.	Severe Per cent	Moderate No.	Moderate per cent	Slight No.	Slight per cent	Total
Multiparae	'A'	112	**26**	157	**37**	156	**37**	425
	'B'	8	**13**	20	**31**	36	**56**	64
Total		120		177		192		489
Difference	'A'–'B'		+13 per cent		+6 per cent		−19 per cent	
		$X^2 = 10.30$.		P less than 0.01.				

TABLE 4.

Mode of Delivery in all Primigravidae ("A" and "B" Cases).

Mode of delivery	Total cases	Per cent	Severe Cases	Severe Per cent	Moderate Cases	Moderate Per cent	Slight Cases	Slight Per cent
Spontaneous	196	**35**	15	**14**	71	**38**	110	**41**
Caesarean section ...	118	**21**	73	**69**	33	**18**	12	**4**
Craniotomy	18	**3**	7	**6**	4	**2**	7	**3**
High forceps	17	**3**	3	**3**	5	**3**	9	**3**
Other forceps operations	185	**33**	7	**7**	68	**37**	110	**41**
Others	26	**5**	1	**1**	4	**2**	21	**8**
Totals	560		106		185		269	

TABLE 5.

Mode of Delivery in all Multiparae ("A" and "B" Cases).

Mode of delivery	Total cases	Per cent	Severe Cases	Severe Per cent	Moderate Cases	Moderate Per cent	Slight Cases	Slight Per cent
Spontaneous	185	**39**	8	**7**	73	**41**	108	**56**
Caesarean section ...	191	**39**	104	**86**	64	**36**	23	**12**
Craniotomy	13	**3**	0	**0**	8	**5**	5	**3**
High forceps	36	**7**	4	**3**	16	**9**	16	**8**
Other forceps operations	35	**7**	2	**2**	5	**3**	28	**15**
Others	25	**5**	2	**2**	11	**6**	12	**6**
Totals	489		120		177		192	

TABLE 6.
Mode of Delivery in "A" Cases in Primigravidae.

Mode of delivery	Total cases	Per cent	Severe		Moderate		Slight	
			Cases	Per cent	Cases	Per cent	Cases	Per cent
Spontaneous	189	**40.3**	15	**15.3**	68	**43.3**	106	**49.5**
Caesarean section ...	114	**24.3**	72	**73.5**	31	**19.7**	11	**5.1**
Craniotomy	6	**1.3**	3	**3.1**	—	—	3	**1.4**
High forceps	8	**1.7**	2	**2.0**	1	**0.6**	5	**2.3**
Other forceps operations	135	**28.8**	5	**5.1**	54	**34.4**	76	**35.5**
Others	17	**3.6**	1	**1.0**	3	**1.9**	13	**6.1**
Totals	469		98		157		214	

TABLE 7.
Mode of Delivery in "B" Cases in Primigravidae.

Mode of delivery	Total cases	Per cent	Severe		Moderate		Slight	
			Cases	Per cent	Cases	Per cent	Cases	Per cent
Spontaneous	7	**7.7**	—	—	3	**10.7**	4	**7.3**
Caesarean section ...	4	**4.4**	1	**12.5**	2	**7.1**	1	**1.8**
Craniotomy	12	**13.2**	4	**50.0**	4	**14.3**	4	**7.3**
High forceps	9	**9.9**	1	**12.5**	4	**14.3**	4	**7.3**
Other forceps operations	50	**55.0**	2	**25.0**	14	**50.0**	34	**61.8**
Others	9	**9.9**	—	—	1	**3.6**	8	**14.5**
Totals	91		8		28		55	

TABLE 8.
Mode of Delivery in "A" Cases in Multiparae.

Mode of delivery	Total cases	Per cent	Severe		Moderate		Slight	
			Cases	Per cent	Cases	Per cent	Cases	Per cent
Spontaneous	176	**41.4**	7	**6.3**	70	**44.6**	99	**63.5**
Caesarean section ...	188	**44.2**	102	**91.1**	63	**40.1**	23	**14.7**
Craniotomy	3	**0.7**	—	—	1	**0.6**	2	**1.3**
High forceps	15	**3.5**	—	—	10	**6.4**	5	**3.2**
Other forceps operations	25	**5.9**	2	**1.8**	5	**3.2**	18	**11.5**
Others	18	**4.2**	1	**0.9**	8	**5.1**	9	**5.8**
Totals	425		112		157		156	

TABLE 9.
Mode of Delivery in "B" Cases in Multiparae.

Mode of delivery	Total cases	Per cent	Severe		Moderate		Slight	
			Cases	Per cent	Cases	Per cent	Cases	Per cent
Spontaneous	13	**20.3**	1	**12.5**	3	**15.0**	9	**25.0**
Caesarean section ...	3	**4.7**	2	**25.0**	1	**5.0**	—	—
Craniotomy	10	**15.6**	—	—	7	**35.0**	3	**8.3**
High forceps	21	**32.8**	4	**50.0**	6	**30.0**	11	**30.6**
Other forceps operations	10	**15.6**	—	—	—	—	10	**27.8**
Others	7	**10.9**	1	**12.5**	3	**15.0**	3	**8.3**
Totals	64		8		20		36	

TABLE Y.
Differences Between A and B Cases as regards Proportionate Mode of Delivery.

Mode of delivery	Difference between the percentages ± standard error		
	Primigravidae, Tables 6 and 7	Multiparae, Tables 8 and 9	Primigravidae and multiparae combined, Tables (6+8) and (7+9)
Spontaneous ...	+32.6 ±5.5	+21.1 ±6.5	+27.9 ±4.2
Caesarean section ...	+19.9 ±4.7	+39.5 ±6.5	+29.3 ±4.0
Craniotomy	−11.9 ±2.0	−14.9 ±2.2	−13.2 ±1.5
High forceps ...	− 8.2 ±2.0	−29.3 ±3.5	−16.8 ±1.9
Other forceps ...	−26.2 ±5.4	− 9.7 ±3.5	−20.8 ±3.5
Others	− 6.3 ±2.4	− 6.7 ±3.0	− 6.4 ±1.9

+ signs indicate that A cases showed the larger percentage.
All the differences in Table Y are statistically significant.

One of the most striking features in the previous analysis is the dystocia caused by slight cases of contracted pelvis. Only 41 per cent of all primigravidae with slight contraction were able to deliver themselves spontaneously (Table 4) and, among the multiparae, only 56 per cent were successful in this respect (Table 5). The others required operative interference, and that interference of a major type in an unexpectedly large percentage.

Throughout the entire investigation it will be noticed repeatedly that the cases of slightly contracted pelvis play a very large part in producing the morbid effects associated with contracted pelvis. This is a point of considerable significance; in the first place, because the slight cases will tend to increase relatively in number as rickets diminishes in severity throughout the country, and in the second place, because the slight cases may escape diagnosis.

It will be observed in the incidence of Caesarean section (309 in all), that the rate rises sharply from 21 per cent in primigravidae to 39 per cent in multiparae. The large difference between the percentage of Caesarean sections among primigravidae and multiparae is confined to "A" cases only. This is further evidence that "B" cases are of less severity as regards contracted pelvis than "A" cases. The rise is also partially accounted for by the number of "repeat" Caesarean sections performed (105). Again, in many cases (86) a bad obstetric result in a previous labour or labours determined Caesarean section as the form of treatment, and thus there is a rise in the Caesarean section rate in the moderate and slight categories among multiparae. It is not intended to make a critical analysis of the results of Caesarean section in pelvic disproportion, as extensive analyses have already been published upon this subject, and the cases under review do not present any features which have not been already described by others. Those anxious for such information may be referred to the works of Greenhill,[4] Barrett,[5] Darchman and Pomerance,[6] and Falls,[7] in America; Holland,[8] and Kerr[9] among others in this country.

The operations of craniotomy and high forceps are regarded by obstetricians as operations of necessity rather than choice, and the tables show the extent to which these measures were forced upon the accoucheur.

In the whole series, 31 craniotomies and 53 high forceps operations were necessary. Many of these patients were admitted to hospital after an unsuccessful attempt at

delivery by the forceps outside. The risks associated with failed forceps are already widely appreciated and the number of such cases occurring in the present series is 36. Tables 6, 7, 8, and 9 show the mode of delivery in "A" as compared with "B" cases. It should be particularly noted that the craniotomy and high forceps operations occur chiefly in the "B" category. (Reference to Table Y shows this difference to be statistically valid.)

To indicate the difference between labour associated with contracted pelvis, and labour associated with normal pelvis, a control series has been taken. The case histories of 556 primigravidae and 452 multiparae who were actually delivered and whose pelves were normal have been analysed. These women were chosen to form a control group in that they attended an antenatal clinic in the earlier months without being referred there by a doctor or other medical adviser; thus excluding patients who might have been referred on account of pelvic abnormality. Their reason for attending, in the first instance, was to secure the services of the hospital, either Indoor or Outdoor departments, at the time of their confinement. Having once attended, they were required to report at regular intervals. Some were delivered in their own homes by pupil midwives and others in hospital. In this group of 1,008 cases, abnormal positions and presentations and the other complications of pregnancy, such as albuminuria and haemorrhages, occur in their usual proportions. The comparison between their method of delivery and the method of delivery in the contracted pelvis cases is shown in Table 10, page 300.

Each twin counted as a separate delivery.

Dystocia

The part played by the child in causing dystocia is an important factor and is worthy of some consideration. It is of value to examine the varying weights of the babies in those women who delivered themselves by the vaginal route spontaneously or with assistance (see Tables 11 and 12 and Table W, page 301). In the primigravidae the average weight of the babies delivered spontaneously in the severe group was 6 pounds, in the moderate 6.6 pounds, and in the slight group 6.7 pounds. A rise in the average weight of 0.3 of a pound rendered delivery by the forceps necessary in the severe and moderate groups. Among those who required craniotomy the average weight was 1 pound heavier, but that only brings the average weight of the children to what is considered a normal weight, namely 7.5 pounds. It may, therefore, be considered that unless a child is under average weight and not more than 6.5 pounds, there is a poor prospect of spontaneous delivery. In studying the averages of weights and the lengths of labour, it appeared that there was only a small margin of safety and that a difference in weight of 0.6 of a pound might affect the prognosis adversely, and it was also noted with interest that, in cases of contracted pelvis of slight degree, severe dystocia occurs with a normal $7\frac{1}{2}$ pounds baby. A number of women do deliver themselves spontaneously of babies of $7\frac{1}{2}$ pounds, and occasionally of over this. The main reason for these spontaneous deliveries is that the patient has stronger uterine contractions, a greater endurance than normal and is temperamentally suited to bear such pain. She may be said to have a satisfactory 'labour equation.' If this were not the case and if all patients had a similar labour equation, it would be found that the larger the baby, the longer the labour. The statistics show no such correlation.

It is quite apparent from this that a woman may take longer to deliver a 6-pound child than another to deliver an 8-

TABLE 10.

A Comparison of Mode of Delivery in Patients with Contracted Pelves and Patients with Normal Pelves.

PRIMIGRAVIDAE.	Normal pelvis (556)	Contracted pelvis (560)
1. Spontaneous	84.9 per cent	35.0 per cent
2. Forceps	11.3 ,, ,,	36.1 ,, ,,
3. Caesarean section*	0.7 ,, ,,	21.1 ,, ,,
4. Craniotomy	— ,, ,,	3.2 ,, ,,
5. Others: extraction breech, etc. ...	3.1 ,, ,,	4.6 ,, ,,
	100	100
MULTIPARAE.	**Normal pelvis (452)**	**Contracted pelvis (489)**
1. Spontaneous	96.8 per cent	38.7 per cent
2. Forceps	2.2 ,, ,,	14.5 ,, ,,
3. Caesarean section*	0.4 ,, ,,	39.1 ,, ,,
4. Craniotomy	0.2 ,, ,,	2.7 ,, ,,
5. Others: extraction, breech, etc. ...	0.4 ,, ,,	5.1 ,, ,,
	100	100

* The 4 Caesarean sections occurring among the primigravidae were performed on account of placenta praevia (2), brow presentation (1), and respiratory disease (1). The 2 Caesarean sections occurring among the multiparae were performed on account of cardiac disease (1), and nephritic toxaemia (1).

pound child, and, of course, this corresponds with all of our clinical experience.

The cases with a satisfactory labour equation in contracted pelvis are few but they are dramatic and therefore apt to be misleading and, while they do occur, they do not often occur. It may therefore be assumed that an average woman with an average labour cannot deliver an average child if she has a contracted pelvis—be it slight, moderate, or severe. For a spontaneous vaginal delivery, the child must be below average weight, the mother must have stronger uterine contractions than the average, and must be temperamentally capable of enduring them.

Ince and Young[10] have shown the importance of the size of the child's head in estimating foetal weight. Ince has stated that the variation in either the bi-parietal and occipito-frontal diameter of the foetal skull is too great to allow an accurate estimation of either the birth weight or the maturity in any given case although it will give a rough guide to the average weight and maturity.

In this fact may lie the reason for an occasional heavy child being born spontaneously in that its head is smaller than the weight would suggest. Usually, however, the safe limits of weight of the foetus are as I have indicated.

The significance of the number of labour pains which a patient with contracted pelvis has to suffer has been appreciated by the continental obstetricians to a greater

TABLE 11.*

Average Length of Labour and Weight of Child in Primigravidae

Mode of delivery	Number of cases			Average weight of babies in pounds			Average length of labour in hours		
	Severe	Moderate	Slight	Severe	Moderate	Slight	Severe	Moderate	Slight
Spontaneous ...	14	67	105	6.0	6.6	6.7	18	23	25
Breech extractions	—	2	13	—	6.3	7.0	—	39	33
Forceps	10	63	112	6.3	6.8	7.3	33	36	36
Craniotomy ...	6	4	8	7.3	7.3	7.4	84	68	56

* Tables 11 and 12 represent only those cases in the series in which the duration of labour was noted and personally observed by the author. They are not, therefore, directly comparable with Tables 4 and 5.

TABLE 12.

Average Length of Labour and Weight of Child in Multiparae.

Mode of delivery	Number of cases			Average weight of babies in pounds			Average length of labour in hours		
	Severe	Moderate	Slight	Severe	Moderate	Slight	Severe	Moderate	Slight
Spontaneous ...	9	70	102	6.6	6.9	7.3	10	15	17
Breech extraction...	—	8	5	—	6.9	6.7	—	12	9
Forceps	5	22	44	7.4	8.1	8.1	46	31	27
Craniotomy ...	—	9	5	—	8.4	7.8	—	61	37

TABLE W.

Average Weights of Babies.

	Spontaneous deliveries			Forceps deliveries		
	Slightly contracted pelvis	Moderately contracted pelvis	Severely contracted pelvis	Slightly contracted pelvis	Moderately contracted pelvis	Severely contracted pelvis
Primigravidae						
Mean and S.E.	6.7 ±0.10	6.6 ±0.10	6.0 ±0.29	7.2 ±0.10	6.8 ±0.14	6.3 ±0.33
S.D.	0.98	0.84	1.10	1.05	1.11	1.03
Multiparae						
Mean and S.E.	7.4 ±0.11	6.9 ±0.12	6.6 ±1.16	8.1 ±0.17	8.0 ±0.34	7.4 ±0.68
S.D.	1.14	1.02	0.49	1.15	1.58	1.53

TOTALS: Primigravidae ... 6.80 ±0.22 pounds; Multiparae ... 7.42 ±0.31 pounds } Difference ... 0.62 ±0.246 pounds

			Average length of labour	S.D.	C. of V.
Primigravidae	Spontaneous deliveries	Slightly contracted (105)	24.7 ±2.11 hours	21.24 hours	86 per cent
		Moderately contracted (67)	22.9 ±1.92 hours	15.70 hours	69 per cent
Multiparae	Spontaneous deliveries	Slightly contracted (102)	19.9 ±1.17 hours	11.61 hours	58 per cent

S.E. = Standard error.
S.D. = Standard deviation.
C. of V. = Co-efficient of variation.

extent than elsewhere. Frey[11] has introduced a method of pain counting and a series of tables whereby he claims to be able to predict the optimal time for interference. He and his co-workers claim to have improved their results by using this method. They have been supported in this contention by many, particularly Müller,[12] Held,[13] and L'Orande.[14] The last named stresses also the quality of the contractions, which he measures. The value of such observations is obvious.

Stillbirths.

We have now considered the dystocia caused by pelvic contraction. Let us consider the effect of this dystocia upon the child. The Boyd Orr Report[15] has turned the searchlight upon the high neonatal and infant mortality rates in Scotland and particularly in Glasgow. Contracted pelvis contributes its quota. The following tables show this. The first (Table 13) shows the fate of the child in the control group with normal pelves, the second (Table 14) the fate of the child in the group with contracted pelves.

In the control series with normal pelves the stillbirth rate was 39 (per 1,000 live births) in primigravidae, and 30 (per 1,000 live births) in multiparae, whereas in contracted pelvis the rates were 167 (per 1,000 live births) in primigravidae and 133 (per 1,000 live births) in multiparae. Stillbirth

Table 13.
Normal Pelvis.

Mode of delivery	Primigravidae			Multiparae			Total
	Alive and well	Stillborn	Neonatal death	Alive and well	Stillborn	Neonatal death	
Spontaneous	446	16	10	423	7	7	909
Forceps	62	1	—	6	4	—	73
Breech	12	4	1	1	1	—	19
Craniotomy	—	—	—	—	1	—	1
Caesarean section	4	—	—	2	—	—	6
Total	524	21	11	432	13	7	1008

Table 14*.
Contracted Pelvis.

Mode of delivery	Primigravidae			Multiparae			Total
	Alive and well	Stillborn	Neonatal death	Alive and well	Stillborn	Neonatal death	
Spontaneous	179	12	5	167	14	8	385
Forceps	152	43	7	45	23	3	273
Breech	12	6	1	9	2	2	32
Craniotomy	—	18	—	—	13	—	31
Caesarean section	113	—	5	181	4	6	309
Total	456	79	18	402	56	19	1030

* The totals in this table differ slightly from preceding tables by 7 primigravidae and 12 multiparae. These have been excluded as in each case the patients either miscarried or were undelivered. They should, therefore, not figure in a comparative table when stillbirth rates are being considered.

is more than four times more frequent in cases of contracted pelvis than in cases with normal pelves. But the stillbirth rate in Caesarean section is notably low (1.3 per cent) and, when we put on one side the Caesarean section cases, we find the stillbirth rate rising to 222 per 1,000 live births in primigravidae delivered by the vaginal route, and 222 per 1,000 live births in multiparae delivered by the vaginal route.

The stillbirth and neonatal death rates shown in the tables are high and it should be remembered that these are the results obtained when such cases are under the care of experienced obstetricians. With less skilled attention the results may be even more serious, and this can be appreciated by examining the previous obstetric histories of the multiparae in the series. The majority of these women had in the past been delivered in their own homes, although a few had been in the Glasgow Royal Maternity Hospital and in other hospitals. There had been 812 previous full-time deliveries by the vaginal route; of these 249 were stillbirths, and 93 were neonatal deaths. Stillbirths or neonatal death had occurred in 42 per cent of the vaginal deliveries. This fact is eloquent testimony of the toll taken of child life by contracted pelvis.

Puerperal Pyrexia.

Stillbirth is only part of the story. Let us consider the effect on the mother. Protracted labour occurred and instrumental delivery was followed often by puerperal sepsis. Twenty-five per cent of all the primigravidae and 18 per cent of all the multiparae showed puerperal morbidity under either the British Medical Association or the Ministry of Health standards.

Table 15 concerns only cases delivered by the vaginal route, and it will be seen that the pyrexia rate in the primigravidae is considerably higher than that in the multiparae.

Table 15.

Pyrexia in Patients Delivered by the Vaginal Route (Total Cases).

	Craniotomy			High forceps			Mid forceps			Low forceps			Spontaneous		
	No. of cases	Pyrexia	Per cent	No. of cases	Pyrexia	Per cent	No. of cases	Pyrexia	Per cent	No. of cases	Pyrexia	Per cent	No. of cases	Pyrexia	Per cent
P =	18	13	**72**	17	4	**23**	116	28	**24**	69	16	**23**	196	31	**16**
M =	13	3	**23**	36	3	**8**	27	2	**7**	8	0	**0**	189	4	**2**
	31	16		53	7		143	30		77	16		385	35	
P–M			49 ±15			15 ±11			17 ±6			23 ±5			14±3

P = Primigravidae. M = Multiparae.

Trauma Sustained During Parturition.

The high incidence of instrumental interference in cases of contracted pelvis has been shown, also the pyrexia rate in these patients delivered by the vaginal route. While the effects of this interference and pyrexia may only appear later (and this aspect has been commented upon by Strachan[16] and by MacIntyre[17]) a number

of patients sustained damage at the time of parturition, causing immediate disability.

As might be expected, a very large number of perineal and vaginal lacerations occurred, but these have not been considered specially because perineal and vaginal lacerations may occur in women with normal pelves as a result of instrumental interference.

The cases detailed below (Table 16) are those in which serious damage occurred attributable mainly to the presence of contracted pelvis.

TABLE 16.

Nature of trauma	Primigravidae	Multiparae	Total
Vesicovaginal fistula	2	1	3
Complete perineal tear (or rectovaginal fistula)...	13	1	14
Cervical and severe vaginal laceration	10	5	15
Severe vaginal, perineal and/or vulvar laceration	30	5	35
Traumatic separation of symphysis pubis ...	0	1	1
	55	13	68

MATERNAL MORTALITY.

The maternal mortality rate for the series was 21 per 1,000 (22 in 1049). In the normal group it was 3 per 1,000.

These fatal cases in the series brought out in strong relief all the perils with which we have to contend but there were only 22 —hardly sufficient for any statistical deductions. I therefore collected a consecutive series of 100 maternal deaths in women with contracted pelvis which had occurred over a period of 9 years in the hospital. These cases show wherein the dangers lie. This part of the study was more than a mere analysis of records as the majority of cases I had observed personally and had discussed the others with those responsible for their care and with the pathologist of the hospital, Colonel Sheehan. The majority of these patients died either immediately after delivery or early in the puerperium from some cause directly attributable to their delivery. For the purposes of analyses they have been divided into 8 groups. The groups may be defined as follows:

Group I. The patient died immediately after dystocia associated with trauma, shock or haemorrhage.

Group II. The patient died after dystocia associated with trauma, shock or haemorrhage, followed later by sepsis or post-operative pneumonia.

Group III. The patient died after dystocia associated with trauma, shock or haemorrhage, but a concomitant factor such as high blood-pressure or pyelonephritis, rendered the patient more vulnerable.

Group IV. The patient died after dystocia without undue trauma, shock or haemorrhage, but delivery was followed by post-operative pneumonia, post-operative peritonitis, or other post-operative complication.

Group V. The patient died when measures had been taken to prevent dystocia, for example, early Caesarean section, but were followed by shock, peritonitis, or other post-operative complication.

Group VI. The patient died from a condition unassociated with contracted pelvis, but dystocia was a contributory factor.

Group VII. The patient died from a

condition unassociated with contracted pelvis, but contracted pelvis contributed in some way to the fatal issue.

Group VIII. The patient died from a condition unassociated with contracted pelvis, and the contracted pelvis did not in any way affect the fatal issue.

It will be seen that in the first 4 groups death followed dystocia: 67 per cent of the deaths fall into these groups.

In the 5th group death occurred following measures taken to prevent dystocia: 23 per cent of the deaths occur in this group.

In the 6th, 7th, and 8th groups contracted pelvis is either a contributory or only an incidental factor. These latter groups account for only 10 per cent.

primigravidae and multiparae differs to some extent in the same groups, as will be shown.

Group I. In the 1st group the fatal results associated with contracted pelvis are seen in their most dramatic form. Patients healthy before labour whose only abnormality lay in their possessing deformed pelves, go into labour and after labours lasting from hours to days, die either undelivered, during delivery, or immediately after delivery, from trauma, shock or haemorrhage. This category includes 28 per cent of the fatal cases, 16 primigravidae and 12 multiparae.

In this group the average weight of babies in the primigravidae was 8.2 pounds: 2 babies weighed over 10 pounds.

TABLE 17.

Distribution of Fatal Cases in the Above Groups.

	Group I	Group II	Group III	Group IV	Group V	Group VI	Group VII	Croup VIII
Primigravidae (or virtual* primigravidae)	16	11	3	9	8	2	—	2
Multiparae	12	11	1	4	15	1	4	2
Totals	28	22	4	13	23	3	4	4

* Virtual primigravidae are those patients who have had one or more previous abortion, but not a full-time pregnancy.

It will be seen from the above (Table 17) that the risks to primigravidae and multiparae are similar except in Groups IV and V. The preponderance of primigravidae in Group IV is due to the higher sepsis rate following vaginal delivery with associated trauma in primigravidae, already referred to. The preponderance of multiparae in Group V corresponds with the rise in the Caesarean section rate in multiparae as previously discussed. This is not a true preponderance, as there are more cases in which measures were taken to prevent dystocia among the multiparae than among the primigravidae. The cause of death in

It should be noted that in most of the primigravidae the labours were prolonged, the average length being 70 hours. Uterine contractions were either normal or of poor quality, and secondary uterine inertia frequently occurred. The secondary uterine inertia referred to here did not follow strong uterine contractions which passed off as a result of completely obstructed labour. Normal or weak uterine contractions commenced and usually continued for several hours, but, as a result of obstruction, not necessarily great, the contractions passed off and labour became prolonged. At the end of such a pro-

tracted labour, the patient was delivered instrumentally and succumbed almost immediately from shock.

In the multiparae of this group the average weight of babies was 8 pounds. Here however, a different picture presents itself. The labour pains were normal or strong, and the average length of labour 16 hours. Nine of the 12 women ruptured the uterus and died within a few hours from haemorrhage, shock, or both. It is noteworthy that none of the primigravidae died as a result of rupture of the uterus, nor were there any cases in which death followed strong uterine contractions.

This part of the investigation therefore suggests that, for a primigravidae, poor uterine contractions and, for a multiparae, strong uterine contractions, are dangerous when contracted pelvis exists. Personal observations made on patients during the investigation confirm these findings. In many of the multiparae rupture of the uterus was prevented only by timely instrumental interference or Caesarean section.

In view of the fatalities among the primigravidae of this group, whose labour pains were poor in quality, early Caesarean section would probably have improved the results.

In this first group of fatal cases the reasons why steps were not taken to prevent dystocia appear to be as follows. Exactly half (14) of these patients had only a slight degree of pelvic deformity. The average weight of the babies in these 14 cases was 8.6 pounds. Disproportion was not diagnosed either before labour or early in labour. This was sometimes due to a failure to detect the slight degree of contracted pelvis, which could have been largely overcome by careful routine antenatal examination by the pelvimetric methods in common use. In the majority of the cases, however, contracted pelvis was diagnosed, but the size of the child and degree of disproportion were not accurately estimated. This is always an exceedingly difficult estimation, and even with experience and the help of radiographic methods, errors are liable to occur.

The margin of safety for a child between 7 pounds and 8 pounds in weight which is to be delivered by the vaginal route is a very small one (see Tables 11 and 12).

Many of those cases with unsatisfactory "labour equations" are found in this group of fatal cases.

Group II. In the second group the patient who was healthy before labour went into labour, and after a labour lasting from hours to days was delivered. After delivery she suffered from a considerable degree of trauma, shock or haemorrhage, or a combination of all three, but responded temporarily to treatment, only to succumb later from sepsis, peritonitis or post-operative pneumonia, due directly to the circumstances associated with her delivery. This group is responsible for 22 per cent of the fatal cases. There are 11 primigravidae and 11 multiparae. Of the 22 patients 12 died within 5 days of delivery, 9 within 14 days, and 1 lived for 5 weeks.

The sepsis in these cases is neither fortuitous nor the result of spray infection, but follows trauma and laceration. The high pyrexia rate following difficult instrumental delivery and trauma has already been discussed when pyrexia in general was being considered.

Whereas in the 1st group, shock was the most frequent cause of death, in the 2nd group sepsis or peritonitis was mainly responsible. Of the 22 patients, 19 died from one of these causes. It is worthy of note that 10 patients were admitted to hospital after unsuccessful attempts at delivery with the forceps outside the hospital. Almost all the fatal cases resulting from failed forceps fell into this group, demon-

strating clearly that the danger in the failed forceps cases is that they usually sustain severe trauma and readily develop sepsis.

The deaths from post-operative pneumonia are not surprising in view of the fact that when the patients are operated upon they are often in an exhausted physical state, and in many instances the anaesthesia is prolonged owing to difficulties encountered in delivery.

In this group cases of slight pelvic contraction again occur frequently. There were 9 such cases; 9 were moderately contracted and 4 severely contracted.

The average weight of the child in the primigravidae was 7.6 pounds; 0.6 pound less than in the 1st group. This tendency towards a lighter baby in the 2nd group might account for the fact that the mothers were not quite so severely shocked as those in the 1st group. The average length of labour in the primigravidae was 72 hours which is practically the same as the average length of labour in the 1st group.

The average weight of the child in the multiparae was 8.3 pounds in comparison with 8.0 pounds in the 1st group. The difference (in these relatively heavier babies) is only 0.3 pound. The average length of labour was longer, being 26 hours in the 2nd group as compared with 16 hours in the 1st. These patients, possibly by reason of their strength, escaped the sudden and dramatic death of those patients in the 1st group. They did so, however, only to succumb later, in an exhausted and lacerated state, to sepsis.

Group III. In the first 2 groups the patients were healthy prior to labour. In the 3rd group the patients' health was impaired prior to labour, and this concomitant factor rendered them more vulnerable to shock.

The toxaemias of pregnancy, cardiac disease and other conditions complicating pregnancy are likely to be encountered in women with contracted pelves with the same frequency as they occur in women whose pelves are normal. It is useful to know to what extent these factors affected the fatal issue, and it was found that in a relatively small number of the fatal cases (4 per cent) these factors did operate.

In this 3rd group there are 2 cases of slight pelvic contraction, 1 of which was delivered spontaneously and 1 by mid-pelvic forceps. There is 1 moderate case delivered by mid-pelvic forceps, and 1 severe case delivered by lower uterine segment Caesarean section. Two of the patients had an associated inflammatory condition (pyelonephritis and intrapartum uterine sepsis). The other 2 are associated with toxaemias of pregnancy. The 3 patients delivered by the vaginal route had prolonged labours: the 4th was the case of Caesarean section.

The babies delivered by the vaginal route weighed 8.3 pounds, 7.1 pounds, and 8.5 pounds. While they were relatively heavy their weight is by no means unusual or excessive, according to normal standards. The degree of shock which followed delivery was out of proportion to the seriousness of the operation performed. The intensity of the shock which caused death was in part due to the presence of the concomitant factor.

In this group and also in Groups VI and VII the fatalities are included which occurred when contracted pelvis was associated with abnormal pregnancy. There are many cases in which abnormal pregnancy is complicated by contracted pelvis, but which do not end fatally. These cases often present most difficult obstetric problems. In treating the toxaemia, haemorrhage, infection or other abnormality, it is always necessary to consider the possibility of further complication due to contracted pelvis. In many cases the presence

of contracted pelvis, or the dystocia which may be associated with it, influences the treatment. It may be impossible to carry out the treatment of choice in the presence of contracted pelvis, and the patient may therefore be subjected to a greater risk. An example of this type of case may be quoted: a primigravida with a severe degree of pre-eclamptic toxaemia occurring in the last weeks of pregnancy, who would normally have had labour induced, may be subjected to a Caesarean section on account of severe pelvic contraction.

Group IV. This group of fatal cases is responsible for 13 per cent of the total. The patients were healthy women before labour, but dystocia resulting from contracted pelvis occurred. This dystocia was considerable: of the 13 cases, 5 died from peritonitis, 5 from post-operative pneumonia, 1 from late chloroform poisoning, 1 from embolism and 1 from sepsis. Eleven of the cases are classed as "B" cases, that is, cases in which treatment was prejudiced by previous failure in diagnosis or treatment before admission to hospital. To avoid undue shock or trauma, 8 were delivered by Caesarean section, and in 5 it was possible to deliver vaginally without undue shock or trauma. The group is composed chiefly of cases of moderate pelvic contraction, 9 out of 13 being such cases; 2 were severe cases; and 2 slight. The average weight of the 13 babies was 7.1 pounds, and the average length of labour 29 hours. Had labour not been cut short by Caesarean section in 8 of these cases, it is certain that the average length of labour would have been considerably longer.

The high incidence of instrumental and operative interference required in cases of contracted pelvis must inevitably be a factor in post-operative mortality. In Group V, which is to follow, the cases were specially selected for operation. In Group IV, and in the preceding groups, the operation necessary was dictated by necessity rather than choice. The patients were partially exhausted by long labour and transport in labour from their homes to hospital. Many were potentially infected by multiple vaginal examinations. It is not surprising, therefore, that deaths from peritonitis and pneumonia occurred. It is in this group that a considerable improvement might be obtained by the exercise of reasonable antenatal care in pelvimetry and the general appreciation of the necessity for all women in whom contracted pelvis is even suspected to be under expert supervision in an institution from the onset of labour. In this respect it should be noted that the group as compared with the preceding groups shows a difference in the degree of severity of contracted pelvis—slight cases are in the minority. It has been stressed by many (Munro Kerr,[18] Brown,[19] Mayer,[20] Puppel,[21] and Robertson[22]) that cases of contracted pelvis are not suitable for domestic confinement. There is no reason to anticipate any difficulty in the diagnosis of moderate and severe cases of contracted pelvis such as were present in the group; therefore, an improvement in the results should be looked for.

Group V. The cases in Group V represent the fatalities among those patients in whom contracted pelvis was diagnosed either before labour or early in labour, and in whom an operation of election was carried out in order to prevent severe dystocia which was considered likely to occur. These patients received what may be termed "prophylactic treatment." With one exception, they are Group "A" cases. They comprise 23 per cent of the total fatalities—a high figure. However it should be realized that were cases not treated by prophylactic measures there would be a greater number of fatalities among the severe cases of pelvic contraction. These

potential fatalities would fall into other groups, increasing them while the percentage in Group V would be decreased.

It is possible in this group to give a group percentage mortality rate, that is to say, the 23 deaths occurred in a series of 1,193 cases in which prophylactic measures had been taken. The "prophylactic measures" undertaken were Caesarean section either before or early in labour and premature induction of labour. Induction of premature labour was employed in only approximately 25 per cent of the cases. Caesarean section was always the method of choice in the more serious cases. The mortality rate within the group emerges at 2 per cent. From this it appears that, even in the best circumstances, severely contracted pelvis causes a high maternal mortality rate.

It is impossible to assess an accurate group mortality rate in the other groups, as they represent the fatalities occurring in an unknown number of cases of contracted pelvis. This unknown number is composed not only of all hospital cases of contracted pelvis which were not treated prophylactically, but also of the entire number of women with contracted pelvis who gave birth to children outside the hospital. The latter, either on account of successful deliveries in their homes or for some other reason, do not seek admission to hospital and there is no record of their numbers.

The results occurring in the patients in category "A" who received prophylactic treatment cannot be contrasted with the results occurring in patients in the same category who did not receive such treatment, as those receiving treatment were specially selected on account of the severity of the pelvic contraction.

It is reasonable to regard the 23 per cent fatalities which occurred in Group V as being unavoidable in the light of our present knowledge and technique. Improvement in operative technique can hardly affect this figure. Advances in accuracy of diagnosis or post-operative therapy may improve the results slightly, but this group must approximate closely to the irreducible minimum so long as contracted pelves exist.

In Group V there are 8 primigravidae and 15 multiparae. The group is composed of 15 cases of severely contracted pelvis, 6 moderately contracted, and 2 slightly contracted. This is the only group in which severely contracted cases preponderate.

They were all delivered by Caesarean section and therefore the weight of the babies and the duration of labour have no influence on the fatal issue. Eleven classical Caesarean sections, 8 repeat classical Caesarean sections, and 4 lower uterine segment Caesarean sections were performed.

Death was due to a variety of post-operative causes in which peritonitis and shock predominate, the former being responsible for 7 cases and the latter for 4. Other causes of death include death under anaesthesia (3), pneumonia (2), postpartum haemorrhage (2), paralytic ileus (2), volvulus (1), post operative anuria (1), and embolism (1).

Groups VI and VII. Groups VI and VII should be considered together. They are small groups and, together, account for only 7 per cent of the fatal cases. In none of the cases was contracted pelvis the direct cause of death, but in all contracted pelvis contributed in some way to the death.

In Group VI the dystocia associated with contracted pelvis aggravated the condition which was the ultimate cause of the patient's death.

In Group VII there was no dystocia, but the presence of contracted pelvis caused difficulties in the management of labour,

and this difficulty so complicated the treatment that the patient succumbed to another condition which might not otherwise have proved fatal.

In Group VI there are 3 patients, all of whom died of eclampsia. All 3 cases required difficult mid-pelvic forceps deliveries. Few convulsions occurred (a maximum of 3). These seizures occurred after dystocia and about the time of the patient's delivery. All authorities on the treatment of eclampsia state that the less disturbance the patient suffers in labour, the more favourable the prognosis. Stroganoff,[23] indeed, insists that this aspect is one of the most important factors in the successful treatment of eclampsia. Major operative procedures should be avoided so far as possible when treating such cases. It is therefore not surprising to find that, when a patient with a severe pre-eclamptic toxaemia has her delivery complicated by severe dystocia associated with contracted pelvis, the result may be fatal.

The incidence of eclampsia in women with contracted pelvis should be the same as the incidence in women without contracted pelvis. Eclampsia may result in death whether the woman has a contracted pelvis or not. In the fulminating type, contracted pelvis cannot be said to affect the issue materially. A case of this nature is to be found in Group VIII, but in the cases included in Group VI it is reasonable to suggest that the dystocia produced by the contracted pelvis was a contributory factor to the occurrence of convulsions and subsequent death.

The cases in Group VII present individually, unusual obstetric problems. For example there is the case of lateral placenta praevia, when, on account of the pelvic contraction, the failure of the head to engage allowed uncontrollable haemorrhage which was ultimately responsible for the patient's death, although the cause of death was an incompatible blood transfusion. This death, it may be suggested was in no way due to the presence of contracted pelvis but to the employment of incompatible blood. In the first instance, however, bleeding would have been controlled had the patient's pelvis been normal. The placenta praevia was lateral, and one which should have caused no difficulty. The presence of contracted pelvis so complicated the issue that the patient lost a considerable amount of blood, and after Caesarean section (on account of contracted pelvis) her condition was so poor that a hurried blood transfusion was given. The blood proved incompatible, and the patient died. Contracted pelvis should be regarded as a contributory factor in this case.

These 2 groups are of considerable interest, in that they show how contracted pelvis, as a secondary factor, can complicate abnormal pregnancy.

During the course of the investigation it was frequently noticed that difficulties were encountered from the presence of contracted pelvis in patients who had been admitted to hospital on account of some other abnormality. In a hospital, such as the Glasgow Royal Maternity Hospital, where the average annual incidence of abnormal pregnancies lies between 60 and 70 per cent in the indoor patients, and where the incidence of contracted pelvis varies between 10 per cent and 15 per cent, it is obvious that there must be a considerable number of cases in which contracted pelvis and another abnormality co-exist. In many of these cases the abnormality is corrected or cured during the antenatal period, and so the patient goes into labour handicapped only by contracted pelvis. In other cases cure cannot be effected, for example in severe cardiac disease. In the latter cases the presence of contracted pelvis may dictate a method of treatment

which is not always that of choice. Only a few terminate fatally, but all are a cause of concern, sometimes of grave concern.

Group VIII. In this group, 4 cases occur in which the patients died from a condition unassociated with contracted pelvis, and in whom the presence of contracted pelvis did not in any way affect the issue. One died from pulmonary tuberculosis 56 days after a lower uterine Caesarean section operation had been performed. The second died of fulminating eclampsia. The third patient died of lobar pneumonia 11 days after a Caesarean section which had been performed on account of central placenta praevia, and not on account of her contracted pelvis, as in her case the contraction was only slight. The fourth died from mixed accidental haemorrhage and the presence of contracted pelvis contributed in no way to the death. Three of these 4 cases occurred in the same year, and were included in the original series of 1,049 cases of contracted pelvis. The occurrence of these 3 fatal cases among the 22 in the first part of the analysis was one of the reasons which led to the further investigation of fatalities in contracted pelvis. In the analysis of the other 79 fatal cases which make up the present series, it is interesting to note that only 1 case occurred in which death was due to a condition entirely unassociated with contracted pelvis.

Conclusions and Consideration of Problems Arising out of the Investigation.

The facts and figures before you show that contracted pelvis is still a problem, a great problem, in parts of Scotland, and that the contracted pelvis I am speaking of is largely rachitic pelvis. I am not suggesting for a moment that it is the same problem that it was 50 years ago.

Then an obstetrician had to decide whether a woman with a 2-inch conjugate could undergo the risk of a Caesarean section or whether it might not be wiser to perform by choice a craniotomy. That problem no longer exists. In 1883–4 Murdoch Cameron performed his first 3 consecutive successful Caesarean sections and since then craniotomy has become an operation performed in dire necessity. As the severity of rachitic contraction diminished and as proficiency in operating increased, especially with the introduction of the lower segment operation, the problem changed and the so-called "border-line" case became the focus of interest. The comparative value of trial labour and induction were extensively debated and I suggest that even that battleground has now become historic.

To-day I think is the day of the slight case; the case which comprises 44 per cent of the 1,000 cases and which was responsible for a fair share of the damage caused by contracted pelvis.

It is important to consider what steps may be taken to improve the present position. The first and ultimate remedy must clearly be the prevention of rickets even in the mildest forms, for the investigation has shown that the slight cases of pelvic contraction give rise to as great difficulty to-day as do the severe ones. It is already well recognized that dietetic and social factors are primarily responsible for the production of rickets. A vast machinery to combat defects in these factors has already been instituted by the Public Health Authorities who have attempted to apply the knowledge already gained by research.

The fact, however, that methods of preventing rickets are already well-known, and that rickets in its grosser forms is something of a rarity to-day, leads sometimes to an attitude of mind which supposes that the danger of rickets has ceased to exist,

whereas, in fact, the condition is still prevalent in minor degrees. By being minor and "masked' it is all the more dangerous to female children when they reach child-bearing age and are discovered to be suffering from contracted pelvis.

It will be readily admitted that the first line of defence against rickets is the care of the child by a healthy and intelligent mother. To produce this type of mother, and to help and guide her in the rearing of her family, antenatal clinics, child-welfare clinics, health visitors, medical inspection of schoolchildren and hospitals for sick children exist. These services are supplied by the State or Local Authorities and, of course, when the patient can afford to pay for medical treatment, she can enlist the services of her private doctor. If all these services are adequately administered and were properly utilized, pelvic contraction due to rachitic deformity would soon cease to be a problem.

The value of the antenatal clinic cannot be overestimated from the viewpoint of the mother's general health. Its contribution to the prevention of rickets is best expressed by Korenchevsky[24] who, as a result of experimental work, has stated that the nourishment of the mother during pregnancy, and particularly during lactation, may be of primary importance in producing or preventing rickets in the offspring.

The child-welfare clinics, where they exist, carry out excellent work. The appreciation by the public of the value of cod-liver oil appears to be gaining ground steadily. Now, in these clinics free cod-liver oil is available, but only the intelligent and careful mother brings her child to these clinics.

There are two main defects in the system. The first is non-attendance. The unintelligent and careless mother whose child is most likely to benefit by these services fails to utilize them. This might be remedied by introducing legislation to strengthen the authority of the Public Health Officers. At present, the pre-school child may be undernourished, unhealthy and unnoticed, and the Public Health Authorities are powerless to take steps to improve this unless the state of the child's health is so grossly impaired as to amount to culpable neglect, when the services of the National Society for the Prevention of Cruelty to Children, and the help of the police may be enlisted. The Public Health Authorities are naturally unwilling to take such extreme measures, and many unhealthy children are left untreated through the ignorance of their parents and the lack of legislation whereby their needs may be attended.

The second defect is failure on the part of the mother to utilize adequately the advice given at the clinic or by her doctor. This may be through lack of education or lack of domestic facilities. She cannot provide her family with a suitable diet and a healthy mode of living. This grave defect can only be remedied by the Education Authorities paying the most serious attention to the education of young girls in dietetics, cooking and household management. It is readily admitted that these aspects of education receive attention in the school curriculum, but the deplorably high level of malnutrition, marasmus, anaemia and "masked" rickets among the children in large industrial towns, is ample evidence of the inadequacy of the attention that has been paid to this part of the mother's education.

It has been suggested by many child-welfare workers that the solution of the problem of marasmic or improperly nourished infants might be found in transferring them from their homes to hospitals where their diet could be supervised for a period of time. But here another problem arises, and is admirably expressed by Graham,[25] who says "I think most pediatricians are

agreed that hospitalization of marasmic infants is bad practice unless strict isolation can be obtained, i.e., cubicles and a rigid nursing technique. Nothing approaching this is yet to be seen in this country, nor do I think this is the way in which the problem should be tackled. Malnutrition, rickets and iron deficiency (anaemia) are woefully common still and all predisposed to infection. Theoretically, malnutrition (inanition) is usually preventable and rickets and anaemia, always. I should like to see the prevention of these conditions emphasized, which would in turn prevent the infant from getting the respiratory or bowel infection which so often proves fatal, to say nothing of freeing hospital beds."

One cannot praise too highly the recent legislation passed by Parliament whereby all pregnant and nursing mothers, together with young children, may obtain milk free or cheaply. A supply of cheap milk should be regarded as being equally important as, for example, a supply of pure water, but, in order that the full benefits may be gained from this measure and other similar measures which may be introduced in the future, it will be necessary to ensure that the public are sufficiently educated to utilize them.

In the prevention of unhealthy conditions arising in the pre-school child, another contact between the public and the Health Authorities might be made by the provision of more nursery schools throughout industrial areas, to which the harassed mothers in overcrowded homes might take their children. The unhealthy and undernourished child might thus be noticed and treatment instituted where necessary. Moreover, the child would be provided with at least one well balanced meal per day.

When the child reaches school age, the machinery for detection of abnormalities is already well established. The medical inspection of school children should detect those children suffering from rickets, and particularly those female children who are likely to suffer in later years from contracted pelvis. This is already being done where rickets exists in its grosser forms. Detection of the milder rachitic manifestations may require a careful examination involving time. In the larger industrial areas, where such conditions may be expected to arise, the numbers of school children to be examined are so large that the school medical officers must, of necessity, devote only a limited time to the examination of each child; thus it is probable that many of the milder degree escape notice and the pelvic deformity is never recognized until the patient suffers from dystocia in childbirth. In girls of school age in whom the disease is already established and bony growth affected, diagnosis is less important than in the case of the pre-school child.

Any consideration of the means whereby the maternal mortality and morbidity associated with contracted pelvis may be reduced would be incomplete without reference to the present-day treatment of such cases. This is all the more necessary in view of the fact that, before methods for prevention of rickets in female children can become effective and find their ultimate reflection in healthy women with normal pelves, there must be a considerable time lag.

If a greater effort were made by all concerned in the care of pregnant women with pelvic contraction, it would be possible to effect some improvement in the present figures, but it must be realized that while contracted pelvis exists a substantial reduction in the maternal mortality and morbidity rates is unlikely. These rates are high because, in the majority of cases, patients with contracted pelvis require some form of obstetric interference in order to effect successful delivery, as has been

already shown. When Caesarean section is necessary, and it is still necessary in many cases, Holland and Munro Kerr,[26] and Bourne[27] have shown that the maternal mortality rate associated with the operation under the best conditions and performed by skilled obstetricians varies between 1 per cent and 2 per cent. When the conditions are prejudiced or the skill lacking, the maternal mortality rate will be very much higher. The very ease with which the operation can be performed and its dramatic character often make it an attractive procedure to the surgical tyro. In this respect Holland[28] has stated generally that Caesarean section is ten times as dangerous as normal birth. Even with induction of labour, when this is possible, the maternal mortality and morbidity rates are higher than when the operation is not necessary.

The investigation has attempted to show the advantage that would be gained if every case of contracted pelvis were recognized before labour, so that provision for skilled treatment could be made in ample time. The earlier recognition of contracted pelvis implies an improvement in the general level of antenatal pelvimetry. It should be impressed in the teaching of students, midwives and general practitioners, that pelvimetry is an essential part of the antenatal examination, and in this respect I cannot condemn too strongly criticisms of the older methods of pelvimetry, such as those of Howkins[29] and of Bourne.[30] It should be obvious that those cases selected for the most careful radiological examination must first be provisionally diagnosed by cruder and less exact methods. Dippel[31] in a well-reasoned article supported by statistics, holds the view that when the diagonal conjugate is 11.5 cm. or less, the information given by this measurement is of an approximate character only, and X-ray pelvimetry is desirable. Where the general incidence of contracted pelves among the population is not likely to rise above 3 per cent (MacLennan[1]) it is impracticable apart from its being extravagant, that every expectant mother should have a complete radiological pelvimetric examination carried out, as has been suggested by Thoms[32] in America and Rowden[33] in this country. The practitioner and the midwife upon whom the recognition of contracted pelvis primarily depends, must use the external pelvimeter, together with digital internal pelvic examination. Moreover, careful observation must be made as to whether the mother exhibits any signs or history of rickets. The patient's height and general stature may be suggestive. Other signs may be very slight and it is often only by careful examination of the long bones and epiphysis that some minor deviation from normal may suggest a mild rachitic deformity.

The fallacies associated with external pelvimetry are well known, but when there is any slight departure from normal this should be a sufficient reason for referring the patient in the first instance to a quarter where the diagnosis can be more definitely established. The difficulties associated with internal digital examination can only be overcome by adequate teaching and practice and, here again, when a doubt arises in the mind of the examiner, the case should be referred for a second opinion. All primigravidae should have the benefit of radiological pelvimetry when the head has not engaged by the end of the 36th week. In the case of the multiparae, the previous obstetric history, while often of the greatest value, appears not infrequently to mislead. A patient whose pelvis is apparently normal, but who has required instrumental deliveries, should be regarded with the greatest suspicion *even when those deliveries have been effected successfully*, as the increase in weight of

the child may readily turn the balance against the patient whose pelvis is only slightly contracted. The disasters associated with this type of case has already been stressed. Once the case of contracted pelvis has been recognized it can best be treated in hospital.

In hospital the greatest care is required for accurate estimation of the degree of deformity present. To-day this can be done most satisfactorily by means of radiological pelvimetry. It is, of course, essential that one of the well-proved methods should be chosen, and those of Thoms,[32] Rowden,[33] Caldwell and Moloy,[34] Roberts,[35] Nicholson,[36] and others have given excellent results. There are many fallacies associated with haphazard radiological pelvimetry, and the interpretation of the radiographs requires expert knowledge. It can be carried out most satisfactorily by a radiologist familiar with the radiographic technique, in association with an obstetrician who is accustomed to assessing the obstetric significance of radiographic deviation from normal. Wherever possible it is advisable to have the services of the radiologist available, not only for antenatal diagnosis but also for examination while the patient is in labour. Caldwell and Moloy and D'Esopo[37] have shown the value of intranatal radiological diagnosis.

While considerable work has been done on cephalometry and the estimation of the size and weight of the child, notably by Reece,[38] Rowden,[39] Scammon and Calkins,[40] Hanson,[41] Clifford,[42] and Bickenbach,[43] among others, it is doubtful whether a sufficient degree of accuracy has yet been established to make it of general practical utility. Ince and Young[10] have pointed out the shortcomings of this method of diagnosis, of which much may be expected in the future. The majority of obstetricians are still forced to rely upon their judgment and experience in estimating the size of the child. When the contraction is slight and the judgment of the obstetrician is sound, a strong case can be advanced in favour of induction of premature labour, as has been done by Wyatt,[44] Davidson,[45] and many others, but when pelvic contraction is moderate or severe the margin of safety for the mother and child treated by induction of premature labour becomes progressively less and the claims of trial labour and Caesarean section become increasingly strong (Brews, Wrigley, Gibberd,[46] and others). In this respect it is worthy of mention that the lower uterine segment operation so long advocated by De Lee,[47] Munro Kerr and Hendry,[48] and recently reviewed in its entirety by Marshall,[49] is the operation of choice, and the classical operation (which is still widely practised) is preferable only in exceptional circumstances.

In a trial of labour, when the size of the pelvis has already been ascertained, it is essential for the obstetrician to acquaint himself with the quality, duration and frequency of the uterine contractions. This is a time-consuming element in the conduct of such a case which is of paramount importance and is sometimes delegated to those with insufficient experience. Not only is the quality of uterine contractions of importance, but the patient's capacity to endure strong contractions must also be borne in mind. (The work of Frey, L'Orande, and others has already been referred to in respect of "pain counting").

There is no doubt that it is along these various lines that improvement in the results can be effected.

The purpose of this work was to draw attention to the rachitic pelvis which causes such disasters to the mother and her child. The remedies are in our hands. We must apply them.

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A Case of Acute Inversion of the Uterus

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It is wise that all cases of a rare and important sort should be reported. I therefore bring this case forward with a few comments. I have found statistics ranging from 1 case in 2,000 to none in 250,000.* Thus it is obvious that an individual cannot have more than a minimal experience of such a condition and, for that reason, no one has a right to be dogmatic as to how to apply the correct management. One must be guided to a considerable extent by circumstance and common sense in the individual case.

The patient, a primipara aged 22, was admitted to Maryfield Hospital towards the end of December 1943. Wassermann reaction was positive. Labour pains started at 2 p.m. on December 28th. There had been a mild degree of antepartum haemorrhage without evidence of toxaemia. Vaginal examination did not reveal any sign of placenta praevia. The membranes ruptured at 5 p.m. and the liquor was offensive. The baby was born at 3 p.m. on December 29th, a student and nurse being in attendance. The birth was normal up to this point, but the cord was so short that the baby had to be held close to the mother until it was tied and divided. The baby was alive and mature. There was a moderate perineal tear. This was followed by a complete acute inversion of the uterus. I was sent for urgently. When I arrived at the hospital I found the patient very badly shocked, the uterus right outside the vagina and inverted, and the placenta still attached. There had been no attempt to express the placenta, so this could not have been a contributory cause of the condition. The drag resulting from the shortness of the cord no doubt started cupping at the fundus and the inversion proceeded thereafter easily and rapidly. As the placenta, situated mainly fundally, had not separated to any extent, there had been very little bleeding. I removed the placenta gently and easily replaced the uterus, stimulants having already been given. A blood transfusion was being prepared for, but the patient did not survive long enough for it to be administered.

Various causes are named as being responsible for acute inversion of the uterus such as (*a*) an atonic state of the uterus associated with pressure on the fundus to aid in expelling the placenta; (*b*) dragging on the placenta due to an unduly short cord; (*c*) precipitate labour in the erect position; (*d*) manual removal of the placenta before completely detaching it from the uterine wall and (*e*) the presence of a tumour in the fundus. In most cases the placenta is situated at the fundus.

The signs and symptoms are unmistakable in the case of a complete inversion, namely, shock, sometimes bleeding if the placenta is partly or wholly detached, and the presence of the protruding mass, with or without the placenta attached. The shock is probably due to stretching of the ligaments in which run the sympathetic nerves which supply the uterus. At first, in any case, there is not likely to be constric-

*Probably one case in 30,000 may be a fair estimate.

tion of the mass by the cervix as the latter will tend to be dilated and lax. Later on there may be the development of oedema and then constriction may become a reality, making replacement difficult. Abdominally the fundus cannot be felt. If the inversion is incomplete, especially if there is no extrusion beyond the vulva, the condition might at first be mistaken for a polypus, especially if the general symptoms were not so severe as one would look for in the complete form.

Treatment.

The shock must be treated by the recognized methods. There is a difference of opinion as to procedure in relation to the reposition of the uterus. Various lines of action are here suggested.

1. Refrain from replacing the uterus until the stage of shock has passed off. But if stretching of the sympathetic supply is the cause of the shock, or a contributary cause, it would seem wise to remove the cause as soon as possible so as to try to diminish the degree of shock. Also replacement may become much more difficult and "shock-causing" if oedema develops, not to mention the greater risk of infection occurring the longer the extrusion remains.

2. Replace the uterus at once with the placenta *in situ*. This may be hard to do because of the bulk of the placenta. Also it may lead to further intra-uterine interference if the placenta should require to be removed manually later because of bleeding or because of pathological adherence to the uterine wall.

3. Remove the placenta and replace the uterus at once. As a rule this would seem to be the wiser way, but if shock is profound it may be better to wait in the hope that there may be some measure of improvement, in spite of the argument employed in point 1.

How to replace the uterus.

1. Some advise replacing the fundal part first. But this means that a greater mass will have to pass through the cervical ring. Also there might be a risk of perforating the fundas if anything but very great gentleness were used.

2. Let the first part out, namely the fundus, be the last to be finally replaced. Thus the smaller mass will have to be pressed through the cervical ring and great gentleness will be all that is needed. To my thinking this is the correct way to do the manipulation, keeping a controlling hand over the lower abdomen as the uterus is pushed slowly and deliberately up. If the placenta is still *in situ* this is the only reasonable way to act.

My opinion from the experience of this one case is that the proper method is to remove the placenta from the extruded fundus and then to replace the organ as described in the second method, unless there is some condition, such as extreme shock, which would point to a different method. A blood transfusion may be given first of all if the blood is available. This would not take up sufficient time to allow of oedema developing. If blood cannot be got within a fairly short time, I believe it will usually be found wise to do the replacement as described in the second method and give the blood, if required, as soon after that as it is available. If this is done an anaesthetic will not be necessary as the patient is not likely to be distressed by the manipulations. An anaesthetic would tend to add to the risks.

In this short paper I do not propose to discuss the cases which have become chronic, the shock having passed by, presumably, several days.

In the acute case, surely, the question of abdominal operation does not arise for that

would be inviting a fatal result. Amputation of the extruded mass has been mentioned by some as a possible method of treatment if replacement has been found impossible. I am convinced that this should not be considered in the acute stage. It might have to be considered later on in certain circumstances.

Although the complication is so very rare indeed, it must be kept in mind and guarded against because it is so dangerous when it does occur. The ways to guard against it are: avoid any traction on the cord, never try to express the placenta unless the uterus is contracting reasonably well, never remove a placenta manually until satisfied that the whole of it has been separated from the uterine wall, then slowly bring it out, gripping it completely with the whole hand.

A Case of Primary Ovarian Pregnancy

BY

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THE occurrence of a true primary ovarian pregnancy is sufficiently rare to justify the publication of such a case. Fortunately the literature concerned with this subject is small.

In 1940 Novak,[1] after exhaustive enquiry into the available literature on the subject, concluded that primary ovarian pregnancy was a definite clinical entity, while at the same time stating that primary abdominal pregnancy, despite views to the contrary, was a very doubtful possibility. Novak concluded that 50 cases of genuine ovarian pregnancy had been reported in the literature which conformed to the criteria of diagnosis as formulated by Spiegelberg in 1878. These are as follows:—

(1) That the Fallopian tube on the affected side be intact.
(2) That the foetal sac occupy the position of the ovary.
(3) That must be connected with the uterus by the ovarian ligament.
(4) That definite ovarian tissue must be found in its wall.

In 1941 Wilson and Robins again reviewed the literature and concluded that further genuine cases of primary ovarian pregnancy increased the permissible total to 59. Five further cases were reported by Simard,[3] Nicholls,[4] Eckerson,[5] Ross and Gledhill,[6] and Curtis.[7] Thomas[8] summarizes all this information and adds details of a further genuine case of primary ovarian pregnancy in June 1943. There seems little doubt that this present case is another example of a genuine ovarian pregnancy, and the history, clinical findings, pathological report on microscopical sections and gross specimen are included in these notes.

CASE HISTORY.

The patient, aged 26, a 2-para, had been married for 4 years and had had 2 children both born alive, one at term and one slightly premature. Her last pregnancy had ended in November 1942.

On October 26th, 1943, when 2 weeks over the expected date of menstruation, the patient had sudden pain in her lower abdomen and collapsed without warning. She was admitted to Sir Patrick Dun's Hospital, having been seen by her usual attendant who made a tentative diagnosis of ruptured tubal pregnancy.

When admitted to hospital her general condition was good, and apart from the presence of some slight lower abdominal tenderness no abnormality was detected. There was no vaginal bleeding, nor definite blueing of the vulva nor softening of the cervix. The uterus did not appear to be enlarged. In view of the history of sudden abdominal pain followed by collapse and the history of amenorrhoea, a specimen of urine was sent for Aschheim-Zondek test.

On November 2nd, 1943, the patient was again examined vaginally and some slight enlargement of the right ovary was detected, but this did not appear to be more than is normally found in the

pre-menstrual phase or in the early stages of pregnancy when a corpus luteum is present in the ovary. Later that day the Aschheim-Zondek test was reported positive and on that same day, some hours after the internal examination, there was a sudden and violent attack of right-sided lower abdominal pain. Abdominal rigidity became marked over the lower abdomen, the temperature rose to 102°F, but the patient's pulse, colour and respirations remained normal. Vaginal bleeding did not occur.

Operation.

At laparotomy under gas-ether anaesthesia, the general peritoneal cavity was found to be full of fresh blood. Both Fallopian tubes, the uterus, and the left ovary, appeared normal to superficial examination, but the fimbriated end of both Fallopian tubes seemed tightly closed and an abdominal ostium could not be determined. The right ovary was enlarged to about twice the normal size and the upper pole contained a large red bleeding mass, similar but larger than that commonly seen after rupture of a ripe Graafian follicle.

The ovary was removed by simple ligature, fine adhesions having been divided when as much blood and clot as possible had been removed, and the abdomen closed without drainage.

The further progress of the case was satisfactory and the patient was discharged on the fourteenth post-operative day.

At the time of operation it appeared as if the fimbriated ends of both Fallopian tubes were blocked, the fimbria themselves being enfolded as in cases of salpingitis. Both tubes were, however, quite free from adhesions, kinks, or abnormal thickenings. The actual adhesions present were recent and those formed as a result of the blood extravasation. It seemed, in fact, as if the Fallopian tubes were actually blocked and it is suggested that this may have been so to an extent which allowed the passage of the sperms but which would have prevented the ovum from entering the lumen of the Fallopian tube.

Pathological Report.

Gross.

The ovary was 43 mm. long, 20 mm. from front to back and 22 mm. from side to side. It weighed 13 gr. The surface appeared irregular and in the upper pole there was a dark mass. When cut longitudinally there was in the ovarian substance, besides small developing follicles, a small cyst or cavity. At the upper pole there was an area of haemorrhage circumscribed and about 18 mm. in diameter. The centre of the mass had a small cavity and the surrounding tissue a felted but fairly homogeneous substance. The haemorrhagic part surrounded this. Above this mass was the small cyst, slightly irregular and some 0.9 mm. in diameter.

Microscopic.

Pregnancy was present as shown by masses of chorionic villi with very marked plasmodial trophoblast. This was embedded in blood clot in which there were large numbers of polymorphonuclear leucocytes. On the exterior were masses of decidual looking cells and from their appearance appeared to be derived from corpus luteum cells. There was a clump of these cells lying in one place in what appeared to be a vessel.

Ovarian pregnancy was confirmed.

Comment.

This case of primary ovarian pregnancy occurred during the 2 weeks following the first missed period and thus conformed with what is usual in the cases recorded by others, i.e. the total absence of any vaginal bleeding and other signs of abnormality other than pyrexia, lower abdominal tenderness and collapse are atypical, since shock, vaginal bleeding and the other well-known phenomena of ruptured tubal pregnancy are recorded in similar cases by other observers. The exact mechanism whereby endometrial tissue develops in the ovary in such cases is obscure, but in all probability this is best understood if Meyer's Theory is accepted, i.e., the differentiating potency of the germinal epithelium.

I am much indebted to Dr. W. E. Powell of the Pathological Department, Trinity College, Dublin, for the detailed reports of the specimen.

FIG. 1.

Photograph of ovary, cut longitudinally and showing area of pregnancy at one pole.

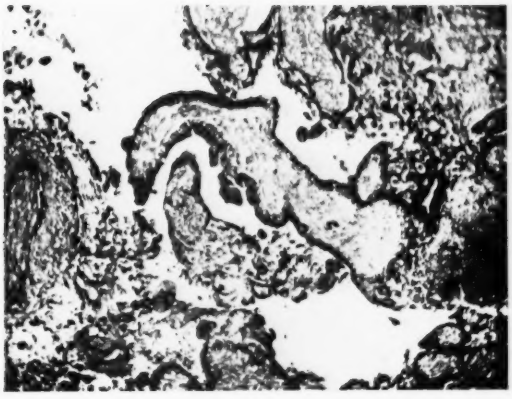

FIG. 2.

Chorionic villi of the pregnancy in the ovary. Syncitial layer well marked. ×80

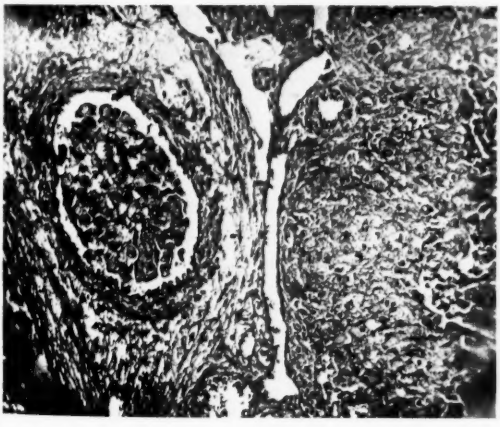

FIG. 3.

Decidua or pseudo-decidua in the ovary. In one part the cells appear to be in a vessel. ×80

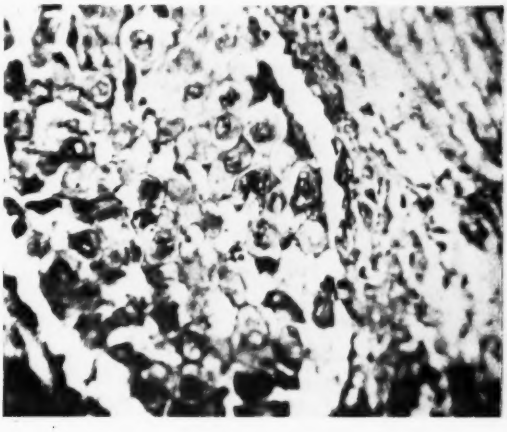

FIG. 4.

High-power view of portion of Fig. 3 to show the decidual cells in the vessel. ×300

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Caesarean Section Under Spinal Analgesia

BY

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WE recently published the records of 121 Caesarean sections performed under spinal analgesia.[1] Of this number, 118 operations were carried out under heavy Nupercaine (Ciba). A full description of the technique of administration of heavy Nupercaine was given, stress being laid on the simplicity of the method, and on the small amount of movement to which the patient is subjected, both of which are important considerations during late pregnancy, and especially in cases of placenta praevia. The advantages and disadvantages, indications for and contra-indications to, spinal analgesia, were fully discussed, and the opinions of various surgeons, some in favour, others against, spinal analgesia, were referred to at some length. In the light of our experience at that time, we were of the opinion that heavy Nupercaine was a safe and suitable drug for use in spinal analgesia in selected cases of advanced pregnancy.

Since the previous article was written, we have continued to use heavy Nupercaine as the anaesthetic of choice for the operation of Caesarean section, and we now record a further 82 sections carried out under spinal analgesia induced with this solution. The technique of administration in the present series has been the same as that previously described except for the following simple but important modification in the positioning of the patient after the solution has been injected into the theca. In the technique first described, after the patient had been turned on her back and the table tilted subsequent to the spinal injection, her legs were allowed to lie flat on the table. In the present series we have flexed the hips and knees as fully as possible, keeping the feet resting on the table. The result is the elimination of the lumbar curve, which, if pronounced, as it may be in some patients, might prevent the solution gravitating over it to reach the required level. We think that some, at least, of the 8 failures mentioned in the previous article were due to this failure of the solution to pass the lumbar curve, and since the adoption of this small modification, we have had very few failures in the last 100 cases. The other probable cause of failure is injury to the venous plexuses resulting in blood-stained cerebrospinal fluid, which fixes the Nupercaine very rapidly.

Premedication has also been the same, namely, ephedrine, gr. 3/4, and atropine, gr. 1/100, administered 45 minutes before the operation. The criterion of success has again been that the spinal anaesthetic did not have to be supplemented by any other form of anaesthesia, and all the cases now recorded conform to this standard. The amount of heavy Nupercaine injected has been almost invariably 2.25 c.c. In the previous series the minimal quantity was 2.5 c.c.

The observations made during the operations comprising the present series confirm in every detail those already recorded. No anxiety has been experienced by an untoward drop in blood-pressure, and the routine use of the baumanometer has been

discontinued, though we still record the blood-pressure in such cases as placenta praevia in which there has been a recent loss, and cardiac disease. It is interesting to record that the patient was the subject of a special note in the previous communication (Table I, Case No. 75), and whose blood-pressure during a Caesarean section performed at a time of great emotional strain dropped to 70/75 mm. Hg, is included among the repeat Caesarean sections in the present series. In view of what had previously occurred, her blood-pressure was recorded with great interest throughout the second operation. There was, however, hardly any variation, and her condition gave us no anxiety whatever. Nor did she raise any objection to the second section being done under spinal analgesia.

We have again not experienced any undue haemorrhage in cases in which the placenta was situated in the upper segment. In patients with placenta praevia, the lower segment has been packed on a number of occasions, the pack being withdrawn through the cervix after 48 hours. There has not been any instance of secondary postpartum haemorrhage.

Post-operative complications have been remarkably few. The most common one has been occipital headache, which has occurred in several instances, sometimes persisting for several days. It has been successfully relieved by luminal, gr. ½, night and morning. The pathology of this headache is difficult to explain, but we think it is probably due to an extra-dural leak of cerebrospinal fluid through the site of puncture. If this is the correct explanation the use of the finest needle should reduce its incidence.

Post-operative distension is rare, and yields quickly to eserine and enemas. It has never persisted for more than 24 hours, and has not been a cause of real anxiety.

We have not had any instances of meningitis or paralysis. The former must, indeed, be due to a very grave error in technique, and can only be attributed to failure of asceptic precautions in the preparation of the skin of the patient, the hands of the anaesthetist, or the sterilization of the syringes or needles.

In our previous paper we made fairly extensive references to the literature, from which it was evident that opinions as to the safety of spinal anaesthesia were divided. We would point out again, however, that many different drugs have been employed to induce spinal analgesia for Caesarean section. Most of these drugs are related to the cocaine group, notably Stovaine, Spinocaine, Tutocaine. Many authorities, including DeLee, Voron, Brouha, Brindeau, and Kronig, think that pregnant women have a special bulbar sensitivity to the action of cocaine compounds. Bourne and Williams,[2] in referring to this, state that "there is a mortality risk attached to spinal anaesthesia which appears to be unavoidable." We have already quoted Marshall's conclusion that "any obstetrician who sets out to perform a large series of Caesarean sections under spinal anaesthesia must be prepared to face a possible maternal mortality of not less than one per cent from this cause alone." Marshall used chiefly Stovaine. We offer no opinion as to the dangers of spinal anaesthesia as induced by such drugs as Stovaine, Spinocaine, Tutocaine, or others of the cocaine group, of which we have no experience. We would repeat that heavy Nupercaine is not related to the cocaine group, and in the light of our experience of it, we see no reason to change our opinion that it is a safe and suitable drug for cases of advanced pregnancy, provided that such cases are carefully selected, and that certain considerations are rigidly fulfilled. It is of

prime importance that due regard is paid to such conditions as low blood-pressure, and the effects of recent haemorrhage, which can, however, usually be counteracted by blood transfusion and other means of stimulation. It seems hardly necessary to say that when a patient's condition is poor as a result of a recent profuse haemorrhage, spinal analgesia should not be induced until such restorative measures have been successfully applied. The criterion of success should be the raising of the systolic blood-pressure to 105 mm. Hg. If this figure cannot be attained, spinal analgesia should not be employed.,

In regard to cases of placenta praevia, we would again stress the importance of having blood ready in the theatre, so that it can be given at a moment's notice. If there is time, such patients should have a haemoglobin estimation done on admission, when, if necessary, pre-operative transfusion can be carried out. This does not, however, obviate the necessity for being prepared for a transfusion at the time of operation. In the previous paper, we described how a patient with a central placenta praevia bled profusely during the process of injection of the spinal anaesthetic, the loss being immediately countered by the transfusion of 50 ounces of blood, for which we were already prepared. We have had a similar experience in the present series, the bleeding commencing after the spinal had been given, at the moment when an examination was being made to confirm the diagnosis. Blood transfusion was immediately started, after which section and transfusion proceeded simultaneously. Transfusion may also be necessary to counteract a heavy loss during the operation itself.

In all cases ephedrine should be given 45 minutes before operation, to counteract a possible drop in blood-pressure following the spinal injection.

Apart from the above, the most important contra-indication, in our view, is to be found in cardiac disease with decompensation, and this applies to both endocardial and myocardial disease. The latter is particularly deceptive, as the poor quality of the heart sounds may be overlooked, and the signs of decompensation may not appear until the disease is fairly advanced. In one or two cases we have noticed that the administration of ephedrine has been followed by a rise in pulse-rate to 140 or more, but without any rise in the blood-pressure. We have thought that such a phenomenon is a sign of a hitherto unsuspected myocardial deficiency, especially in the absence of any endocardial lesion, and have discarded spinal in favour of general anaesthesia. Ashworth[3] named "certain forms of severe cardiovascular disease," and "severe myocardial deficiency" as contra-indications to the use of spinal analgesia.

Before leaving the question of the safety or otherwise of spinal analgesia in pregnancy we would refer to a report (unpublished) of an enquiry concerning death from anaesthesia in Caesarean section operations in a series of 962 cases collected from 25 different L.C.C. general hospitals in the years 1931–37. We are indebted to Dr. Letitia Fairfield for a copy of this report.

Of the 962 patients, 748 were given a general anaesthetic, and there were no deaths attributable to the anaesthetic among this number. Of the remainder, 190 were given spinal anaesthetics, which in 64 cases were supplemented by some form of inhalation anaesthesia, gas and oxygen being used in 53 cases. The spinal solutions used were Stovaine (88), Percaine (39), Planocaine (32), Durocaine (10), Spinocaine (13), and unspecified (8) The variety of drugs will be noted. All except Percaine are related to the cocaine group.

Among these 190 patients there were 6 deaths, of which 3 occurred under Stovaine, and 3 under Percaine. We do not propose to discuss the deaths under Stovaine, as we do not use this drug, and its composition is totally different from that of Percaine.

The 3 deaths which occurred under Percaine require much more consideration. In 2 cases 12 c.c. and 14 c.c. of Percaine were injected, the dose showing that the solution must have been light (hypobaric) Percaine. The specific gravity of the Percaine solution used in the third case is not specified, but it is thought to have probably been light (hypobaric).

The Percaine Handbook (Ciba) describes four different techniques for the administration of light (hypobaric, 1 : 1.500) Percaine. These are the Howard Jones, Harris and Rink modification of the Howard Jones, the Etherington Wilson, and the Sebrechts height to which the solution rises, which in techniques. The method of control of the turn governs the height of anaesthesia, differs in each technique, but every one entails the use of the ventral decubitus, a position which, for a woman in the last few weeks of pregnancy, must be very irksome and difficult to maintain, and must, in any case, be followed by a complete reversal to the dorsal position. The ventral decubitus would, we think, be dangerous in a patient with placenta praevia, and the reversal to the dorsal position must add to the danger. It may be that the pregnant woman at or near term, encumbered and rendered awkward as she is by the large abdomen, is a difficult subject for a complicated technique, so that the height of anaesthesia is less easy to control. The 3 fatalities under light Percaine which we are considering occurred in a manner which suggests a fulminant drop in blood-pressure, the most probable cause of which was a too great height of anaesthesia, with consequent vaso-constrictor paralysis and splanchnic stasis. The report does not state whether ephedrine was used in the premedication to combat a possible drop in blood-pressure.

The simplicity of the technique of injection of heavy Nupercaine is plainly shown by the fact that we have never employed a special anaesthetist, but have given the injections ourselves in every case. New assistants, who have not previously seen spinal analgesia induced with heavy Nupercaine for Caesarean section, have, after watching the procedure on one or two occasions, been able to carry it out thereafter with perfect success. After the spinal injection has been given, only one movement of the patient is required, from the left lateral position to the dorsal, and the patient herself need make no effort in this, as it can be easily done by the nursing staff. The height of anaesthesia is under absolute control by turning the wheels of the table to produce the necessary Trendelenburg slope and to raise the head and shoulders.

That spinal analgesia is not unpleasant to the patient is surely proved by the fact that we have performed Caesarean sections under it twice for each of 24 patients, and three times for one patient. Not one of these patients has raised any objection to the spinal injection being repeated, nor have we seen any fear of this form of anaesthesia. Bourne and Williams state that "the insertion of the needle sometimes becomes a matter of great difficulty even to the expert. During the struggle to overcome such difficulties on the occasions when they are experienced, the woman about to be operated upon is exposed to a degree of discomfort which we consider indefensible." We can say without hesitation that our experience with heavy Percaine is quite the contrary.

The Indications for Operation.

As might be expected, failed trial labour and disproportion provided the majority of

cases in the present series. There were 18 cases of trial labour, the longest lasting 60 hours. In addition there were 4 patients who were booked for trial labour, in whom the membranes ruptured before or at the onset of labour. There were 30 patients with disproportion who were not in labour when operation was carried out, of whom 19 had had one previous Caesarean section, and one who had had two previous sections. One of these patients now had a twin pregnancy with severe pre-eclampsia, and the operation was followed by 8 eclamptic fits. The mother made a good recovery, and both the infants survived.

There were 13 cases of placenta praevia, 10 being central and 3 marginal. A haemoglobin estimation was done as a routine, and nearly all the patients were given blood transfusions before, during, or immediately after the operation. Most of them were examined under the anaesthetic to confirm the diagnosis prior to section. Two bottles of Group O blood were always kept ready in the theatre, together with all the instruments necessary for a transfusion at a moment's notice.

There were 2 cases of obstructed labour, one having a posterior cervical fibroid, the other having bilateral ovarian cysts, which were removed after completion of the section.

In one patient the forceps had been applied before admission, but the vertex was still above the pelvic brim when the operation was performed.

There were two patients with cardiac disease, one of whom also had chronic nephritis, and the other had pelvic contraction for which Caesarean section had been previously performed.

In two cases previous sections had been performed for central placenta praevia. Another patient had been previously operated upon for labour obstructed by an ovarian cyst, and in another it was the second section for pelvic deformity associated with bilateral congenital dislocation of the hip-joint.

The remaining indications were as follows:

Elderly primipara, extended breech, contracted outlet.

Elderly primipara, fibroid uterus (9 fibroids, including 3 in the lower uterine segment), extended breech, contracted outlet.

Elderly primipara, persistent malpresentation, contracted outlet.

Elderly primipara, prolapse of umbilical cord at two-thirds dilatation, vertex still above the pelvic brim.

Uterus unicornis, extended breech, contracted outlet, 4 previous abortions. (This was the first living child.)

Complete stenosis of cervix following previous difficult forceps delivery and stillbirth.

Contracted pelvis. Extended breech. Seven previous abortions. (This was the first living child.)

Hydramnios. Premature rupture of membranes. Foetal distress at two-thirds dilatation. Vertex above pelvic brim. Cord three times round neck.

Toxaemia and accidental haemorrhage.

In all cases the operation performed was a lower segment Caesarean section. In 23 patients it was the second section, and in one case it was the third section. Fifty-seven of the patients were not in labour at the time of operation.

Maternal and Foetal Mortality.

There were no maternal deaths attributable to the anaesthetic. One patient died of sepsis on the 11th day.

All the infants were born alive. Two babies died, the cause of death in each being atelectasis. In one case, the indication for operation was disproportion, and in the other a central placenta praevia. The

mothers were not in labour at the time of operation.

The number of infants delivered was 83. The foetal mortality in this series was therefore 2.4 per cent.

In order that the use of spinal analgesia for Caesarean section should be seen in its proper perspective, our two series of operations should be considered as one, for they have extended continuously over the years 1938–43.

During that time we have performed 203 Caesarean sections under spinal analgesia, of which 200 have been carried out under heavy Nupercaine. There has not been a maternal death due to the anaesthetic in the whole series.

The number of infants delivered is 206, of whom 7 have been lost. The foetal mortality is, therefore, 3.39. This figure is considered low enough to justify the conclusion that spinal anaesthesia is perfectly safe for infants. This conclusion is also strongly supported by the fact that only one infant out of 206 was stillborn; it was macerated, was one of twins, and the mother had a severe toxaemia. Among the 6 infants who died, atelectasis was the cause in 3, maternal toxaemia in a twin pregnancy, prematurity associated with placenta praevia, and haemorrhagic disease of the newborn accounting for the other 3. None of them is attributed to the anaesthetic. Another fact which, in our view, gives even stronger support to the claim to safety for the infants is that in 8 instances, foetal distress from various causes, including 2 cases of prolapsed cord and 2 cases in which the cord was tightly round the neck, was the ultimate factor which decided the question of Caesarean section, and that all these infants survived.

Summary and Conclusions.

We have now recorded two series totaling 203 Caesarean sections performed under spinal analgesia, of which 200 have been carried out under heavy Nupercaine (Ciba).

There has not been a maternal death due to the anaesthetic, or a maternal death under the anaesthetic from any other cause whatever.

Of the 203 patients operated upon, 2 died, one from pulmonary embolism on the 9th day, the other from sepsis on the 11th day. The overall maternal mortality is, therefore, 0.98 per cent.

Of the 206 infants delivered, 199 survived, giving a foetal salvage-rate of 96.6, or a foetal mortality-rate of 3.39 per cent. None of the infant deaths could possibly be attributed to the spinal anaesthetic.

Our confidence in heavy Nupercaine (Ciba) as a safe and suitable drug for use in spinal anaesthesia in selected cases of advanced pregnancy remains unshaken.

Our acknowledgments are due to Dr. Oscar M. Holden, Medical Officer of Health, County Borough of Croydon, for permission to publish these results. All the patients have been operated upon in the two hospitals of the Croydon Obstetric Service, namely, Mayday Hospital (Maternity Department) and St. Mary's Maternity Hospital.

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INIENCEPHALUS

BY

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A STUDY of the literature shows that 57 cases of iniencephalus have been reported to date.[1] Howkins and Lawrie[2] suggest, in their survey of the subject, that reports of such teratological specimens would add to our knowledge of developmental processes, and it is with this in view that I wish to report 4 cases.

According to the medical dictionary, iniencephalus is a "foetus with fissured occiput and protruding brain," and the derivation is from the Greek, "inion," the nape of the neck. The term was first used by Saint-Hilaire,[3] and the cardinal features described in his article and accepted in all subsequent articles are threefold: (*a*) deficiency in the occiput, (*b*) rachischisis of variable extent, (*c*) foetal retroflexion. Lewis[4] has subdivided collected cases into iniencephalus clausus, iniencephalus apertus with small encephalocele, and iniencephalus apertus with encephalocele larger than cranial contents.

Ballantyne[5] distinguishes between "iniencephaly" and "anencephaly with retroflexion." Howkins and Lawrie include 4 cases in which the iniencephalus is associated with anencephalus (presumably Ballantyne's "anencephaly with retroflexion"), and believe that these "form one continuous and inseparable series." This suggests that many cases classified as anencephalus may be associated with unrecognized iniencephalus.

The cases here reported are examples of iniencephalus, *per se*:

CASE 1 (B9972), DECEMBER 1942.

The patient was a married woman aged 38 years. She had had 2 normal pregnancies ending in the spontaneous delivery of 2 living normal children. She was admitted to hospital as an emergency with antepartum haemorrhage, when the period of gestation had lasted approximately 33 weeks. The antepartum haemorrhage was found to be due to a central placenta praevia, and an emergency Caesarean section was performed. Her puerperal history was uneventful.

The foetus was a female, with bilateral talipes (Fig. 1). The head looked up and to the left, the right ear lying in the groove between the face and right shoulder. The external ear was deformed. The sutures and fontanelles were larger than normal, the anterior fontanelle extending to half-an-inch above the root of the nose. There was a meningocele, covered with skin, about the size of a hen's egg at the junction of retroflexed head and neck.

The weight was 3 pounds 11 ounces: the length from vertex to heel, 12 inches: from nape of the neck to anus, 5⅜ inches: and the occipito-frontal circumference of the head was 12⅞ inches.

An incision was made from the vertex down the middle of the back. The foramen magnum was much enlarged, both occipital bones being reduced in size. The meningocele projected over the lower border of both parietal bones, extending laterally 2¼ inches to the right, and 1⅝ inches to the left. There was also a small meningocele with incomplete closure of the spine at the level of the first lumbar vertebra. The ribs showed some abnormalities visible in the X-ray (Fig. 2). All the thoracic and abdominal organs were present and normally developed, but there was a deficiency

in the diaphragm, and the whole stomach and 16 inches of small intestine were herniated into the left side of the thoracic cavity.

CASE 2 (C456), APRIL 1943.

The patient was a married woman, aged 34 years. She had had 6 previous full-time pregnancies and 2 miscarriages. Her labours had been normal, and resulted in the births of normal living children. Her antenatal health with this pregnancy had been normal. At three antenatal visits prior to confinement, hydramnios had been noted. She was admitted in labour 19 days before her expected date. After a 1st and 2nd stage lasting over 19 hours, the foetal heart became very slow and poor, and there was no advance in the presenting part. This was found to be a brow, which could not be converted into a face or vertex presentation. Internal version was done, and the foetus partially delivered when there was further obstruction. Evisceration was performed, and a stillborn female iniencephalic child delivered. The puerperium was uneventful.

The foetus was a female, weighing 5 pounds 10½ ounces (Figs. 3 and 4). The length from vertex to heel was 16 inches, and from the nape of the neck to anus 3½ inches. The occipito-frontal diameter of the head was 14¼ inches. The face looked upwards and slightly to the right. There was no obvious deformity of the limbs. The head was very markedly retroflexed. The area covered by hair extended in a semi-circular area much in excess of normal. An incision was made from the vertex down the back. The posterior edge of the parietal bones approximated to the junction of head with back. The occipital bone was much reduced in size, so that the foramen magnum was very large with protrusion of the cerebellum. This lay on the exposed surface of the spinal cord, with no meninges intervening, and the spine was bifid down to the 11th dorsal vertebra. the edges of the occipital bone lay approximated to the ununited transverse processes of the spine. Post-mortem examination did not reveal any abnormality of the thoracic or abdominal organs.

CASE 3 (O7632), OCTOBER 1943.

The patient was a married woman, aged 37 years. She had had one pregnancy, 5 years previously, with the spontaneous delivery at term of a living normal child. Her antenatal health with this pregnancy was moderate. Her blood-pressure was slightly raised from the 4th month of gestation, and reached 180/100 the week before delivery. Her urine never contained albumin. She went into labour spontaneously in her own home at term. At this time the foetal heart could not be heard. The head remained high for a long time, elongated membranes presenting through the os. The child was delivered as an extended vertex, the shoulders giving a great deal of difficulty. Her puerperium was normal.

The foetus was a female weighing 6 pounds 12 ounces (Figs. 5, 6, 7). The length from vertex to heel was 18 inches, and from the nape of the neck to anus, 6⅜ inches. The occipito-frontal diameter of the head was 14¼ inches. The head was fixed in retroflexion. The anterior fontanelle was very large, and extended to the glabella. The limbs were normally developed. The spine was bifid in the upper cervical region, though the 6th and 7th cervical vertebrae appeared to be complete. It was bifid again in the lower thoracic, lumbar and sacral vertebrae. There was a large meningocele on the back extending to the middle lumbar region. There was a small tentorium, and very small falx cerebri. There was a gap of about 1 cm. in the occipital bone on the right side without actual protrusion of the cranial contents. The thoracic and abdominal viscera were normal.

CASE 4 (O7679), NOVEMBER 1943.

The patient was a married woman, aged 29 years. She had had one other pregnancy 9 years previously, which had terminated in the forceps delivery of a living, normal, full-time child. She had attended regularly at an antenatal clinic during this pregnancy. Marked hydramnios had been noted a few days before she went into labour, and on that occasion the foetal heart was heard. At approximately 32 weeks gestation the baby was born spontaneously and precipitately at her own home before the arrival of the nurses. She was subsequently admitted to hospital with a retained placenta, which, on examination later, showed infarcts. Her puerperium was uneventful.

The foetus was stillborn and macerated (Fig. 8). It was a female weighing 2 pounds. The length from vertex to heel was 12½ inches, and from the nape of the neck to the anus was 3 inches. The occipito-

frontal diameter of the head was 9 inches. Except for the maceration there was no abnormality of the limbs. The face looked up and to the left: there was no apparent neck fold or neck, and there was marked retroflexion of the head on the back. There was a large meningocele over the occipital region and cervical spine. The occipital bone was represented by two small plates of bone, the fragment on the left side being slightly larger than that on the right. Through the large defect thus formed a meningocele protruded containing brain substance. Owing to the advanced antolysis it was impossible to recognize just how much and what parts of the brain were included. The cervical spine was very short and all the vertebrae were bifid. The upper 6 dorsal vertebrae were also bifid. The skin of the back was deficient over the whole area. There was a diaphragmatic hernia on the right side. It was of the true type, with a small sac which projected into the right thoracic cavity behind the pleura at the side of the vertebral column. It contained part of the right lobe of the liver which was pedunclated owing to the constriction by the neck of the hernial sac. There was no other abnormality in the thoracic or abdominal organs.

Discussion.

The cause of this condition is unknown, but it is undoubtedly a developmental error occurring in the early weeks. According to Minot[6] and others, embryos show during the 3rd week an acute lordosis of the spinal column which normally rectifies itself by the 4th week. In a discussion on Dorland's[7] paper, Bartelmez points out that certain poisons inhibit developmental as well as regenerative processes. Thus, something taken by the mother in the early stages of her pregnancy with the idea of causing a miscarriage might, while failing in the mother's object, cause this inhibition. I was unable to obtain a history of such an attempt in any of the cases.

Table I.

Case	1	2	3	4
Mother's age	38 years	34 years	37 years	29 years
Previous pregnancies	2	6 full-time 2 miscarriages	1	1
Sex of previous children	Not recorded	5 males 1 female	Female	Male
Years between last pregnancy and this	Not recorded	3 years	5 years	9 years
Sex of iniencephalic child	Female	Female	Female	Female
Weeks gestation	33 weeks	37 weeks	40 weeks	32 weeks
Weight	3 lb. 11 oz.	5 lb. 10½ oz.	6 lb. 12 oz.	2 lb.
Length (vertex to heel)	12 inches	16 inches	18 inches	12½ inches
Nape of neck to anus	5⅜ inches	3½ inches	6⅜ inches	3 inches
Spina bifida	Cervical region and upper lumbar	Cervical and dorsal	Upper cervical, lower thoracic, lumbar and sacral	Cervical and dorsal
Abnormalities of limbs	Bilateral talipes equinovarus	Nil.	Nil.	Nil.
Abnormalities of internal organs	Diaphragmatic hernia	Nil.	Nil.	Diaphragmatic hernia
Complications of pregnancy	Placenta praevia	Hydramnios	Hypertension	Hydramnios
Complications of delivery	Caesarean section	Internal version and evisceration	Nil.	Nil.
Puerperium	Uneventful	Uneventful	Uneventful	Uneventful.

FIG. 1.

Case 1: Lateral view.

FIG. 2.

Case 1: Lateral X-ray.

S.J.P.

FIG. 3.

Case 2: Lateral view.

S.J.P.

FIG. 4.

Case 2: Lateral X-ray.

S.J.P.

FIG. 5.

Case 3: Posterior view.

FIG. 6.

Case 3: Lateral X-ray.

S.J.P.

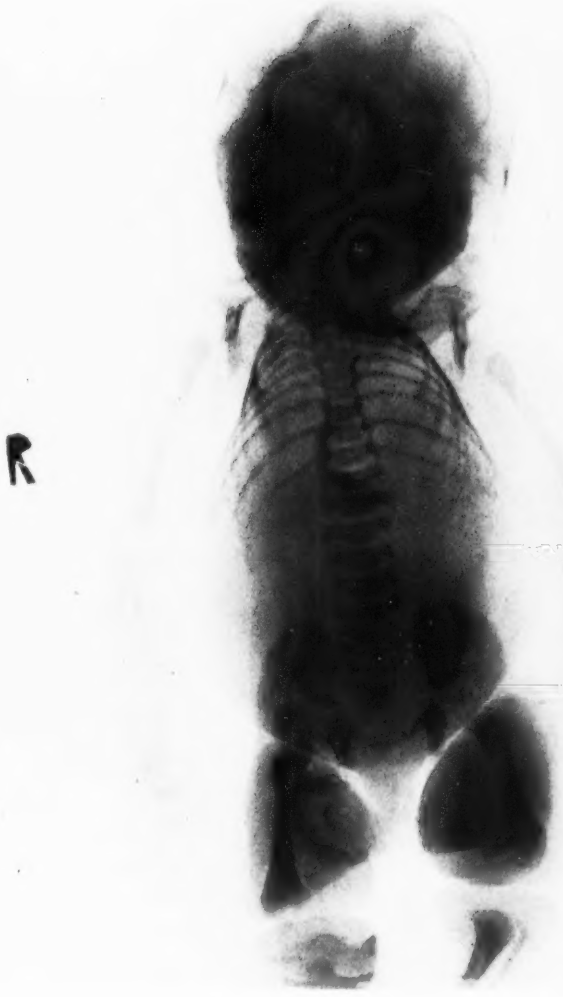

FIG. 7.

Case 3: A.P. X-ray.

S.J.P.

FIG. 8.

Case 4: Posterior view.

S.J.P.

In the 4 cases described, one or two suggestive points emerge. None of the pregnancies were first pregnancies: none of the mothers were very young: where recorded the gap between this and the immediately preceding pregnancy was not small. The foetuses were all female, and other abnormalities were present in 2 of the 4 cases. In every case, there was some abnormality of the pregnancy—placenta praevia, hydramnios, hypertension.

The incidence of this type of developmental abnormality is probably not so rare as earlier writers suggest. The 4 cases described occurred in the routine hospital work of 2 years: the total number of deliveries during that time was 3,583, an incidence of 1 in 896. If the typical features of such cases were as well known as, say, the typical features of hydrocephalus, it would probably prove to be less of a rarity than the total of 57 recorded cases suggests. Adding this series to previous recorded cases the sex incidence to date is 44 female, 5 male, 12 unspecified. Hydramnios is recorded in 12 cases out of a total of 61, and may have been present in more. Diaphragmatic hernia has been noted now in 12 cases and twice the diaphragm was absent. Talipes is the commonest associated abnormality, recorded in 18 cases out of 61.

SUMMARY.

Four cases of iniencephalus are described.

The occurrence of these cases in 2 years of routine hospital practice suggest that the incidence of this abnormality is more frequent than was previously believed.

My thanks are due to my colleague, Dr. J. K. Rose, for permission to use the reports on 2 of her cases, to the technicians who took the X-rays for me, and to my House Surgeons in the Elsie Inglis Memorial Hospital for their valuable assistance.

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A Statistical Study of the Purpose and Errors of the Routine Daily Measurement of the Puerperal Uterus

BY

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DURING the early days of the puerperium, it is customary to measure once a day the height of the uterus above the symphysis pubis and to record this on the temperature chart. Although it is commonly taught and widely believed that the purpose of this routine measurement is to detect subinvolution, the conditions that must be fulfilled and the criteria required for establishing such a diagnosis are not generally known; nor is it always appreciated that this measurement may profitably be used for a purpose other than the detection of subinvolution.

The recorded height of the puerperal uterus is influenced by factors which may be broadly divided into 4 groups. First, there are changes in the size of the uterus. Second, there is the full bladder or bowel. Third, there may be a pelvic tumour. Fourth, there is a group of factors largely outside clinical control; examples are, the thickness of the abdominal wall, the varying tone of the uterus, the location of points for measurement, the position of the patient, different methods of measurement, personal differences between observers, the all too common habit of estimating the height of the fundus by eye or by hand, and so on. In general these factors are just as likely to cause any reading to be too high as too low, and together they constitute the uncontrolled variability or error of the measurement.

When the day to day height of the puerperal uterus is carefully taken and honestly recorded, there is usually some irregularity of the involution line even in a normal case. In the past, fluctuation in the size of the uterus was emphasized as the factor chiefly responsible for this observed irregularity; later, attention was directed to the important influence of the bladder and bowel; and recently, the part played by the error of measurement has been described in detail. The present paper summarizes the clinical application of this larger analysis.[1]

NORMAL UTERINE INVOLUTION.

It is clinical experience that uterine involution starts fast and finishes slowly. Available evidence points to its taking the form, at least in the first 6 days, of a rate of involution that is proportionate to size. The fact that this rate is constantly changing is too cumbersome in clinical work where the uterus is measured only once a day; besides great accuracy is unnecessary, so in practice, average involution may be taken as amounting to half an inch per day during the first week of the puerperium. The expected height of any uterus is, therefore, half an inch less than that recorded on the previous day; this will frequently differ from the observed height. To what extent may this difference be due to the "Error of Measurement?"

ERROR OF MEASUREMENT.

In some institutions all puerperal uterine measurements are made by a senior mid-

wife: in others the daily measurements are made by pupil midwives, and not always by the same person. Each hospital will have its own error, depending on the care with which measurement is made, the number of persons involved and so on. In one, the error of measurement might be low and the recorded heights could be regarded with a confidence that would be misplaced if applied to those from another hospital where the error was high.

The following short investigation which is one of five described elsewhere,[1] illustrates a method of obtaining an estimate of the error of measurement. The design is simple. Ten puerperal patients in whom the uterus could be felt each had the organ measured by 5 persons experienced in measurement; the observers, 4 of whom were nurses and one a doctor, were asked to measure in their usual way. In Table I the fundal heights in inches are tabulated.

TABLE I.

Measurements of the Puerperal Uterus by Practiced Observers

		Patients										Observers' totals
		1	2	3	4	5	6	7	8	9	10	
Observer	1 ...	5.00	5.00	5.00	3.00	4.00	4.50	2.50	4.00	4.00	6.25	43.25
,,	2 ...	4.25	4.00	5.75	1.50	2.50	3.00	1.00	2.50	3.00	5.00	32.50
,,	3 ...	4.50	4.50	5.00	2.00	2.50	2.00	3.00	1.50	4.00	6.00	35.00
,,	4 ...	4.50	5.00	6.00	2.50	4.50	3.00	1.50	4.00	3.50	5.50	40.00
,,	5 ...	4.50	5.00	5.50	3.00	4.00	4.25	2.25	3.50	4.25	6.50	42.75
Patients' totals		22.75	23.50	27.25	12.00	17.50	16.75	10.25	15.50	18.75	29.25	193.50

Preliminary inspection of the table shows four points of interest. First, 44 out of 50 readings were given to the nearest half inch; this heavy bias in favour of the whole or half inches was largely due to the fact that Observers 1, 2, 3, and 4 were accustomed to measure only to this degree of accuracy. Second, the variation in the "Observers' Totals" column shows the differences between observers, one having measured high, whereas another has measured low. The sum of the measurements of Observer 2 (32.50 inches) is over 10 inches less than that of Observer 1 (43.25 inches); this amounts to more than 1 inch per patient. Third, the "Patients' Totals" row shows great differences between patients, as would be expected from measurement of uteri at different stages of involution. Fourth, comparison between the measurements of any two observers shows that, though one may have set his measure higher than the other as judged from the Totals column, this difference in total is made up of differences that are subject to considerable variation. Thus, Observer 5 measured higher than Observer 4 on 5 occasions and lower on 3 occasions. Such inconsistencies are present in every complete comparison between the measurements of any two observers, and together they add up to make the uncontrolled variability or *error of the measurement*. By recognized statistical methods described in the Appendix this error may be extracted from the data; it amounts to 0.8 inch for comparisons between 2 readings. The interpretation may be expressed as follows. A difference between the expected height (see above) and the observed height of the puerperal uterus of not more than twice the error—approximately $1\frac{1}{2}$ inches—may reasonably be attributable to the error of measurement. A difference greater than three times the error—approximately $2\frac{1}{2}$ inches—is almost certainly not due to error of measurement, but to some other influence.

The variability due to differences between

observers is not included in this estimate of error. In some institutions the routine puerperal uterine measurement of individual cases is the responsibility of not one person but a group of persons. It is important, therefore, to consider the effect of including the influence of different observers in the above estimate. When this addition is made, the observed height of the uterus must be more than 2 inches greater than the expected height—as calculated from the average rate of involution—before this supposed abnormality may with safety be attributed to anything but the error of measurement. The inclusion, therefore, of the effect of different observers, even though they are practised in the measurement, has led to a loss of precision amounting to approximately half an inch—or a complete day's involution.

of such an investigation and greatly shorten the work involved.

As would be expected, the estimated error of measurement varies under different conditions. Both medical students and an experienced sister tutor were able to reduce it to approximately $\frac{1}{2}$ inch; this improvement was largely due to the fact that they measured to the nearest $\frac{1}{4}$ inch, in contrast to the practised observers of the previous investigation who most often measured to the nearest $\frac{1}{2}$ inch. By selecting only those cases in which the uterus could be measured comparatively easily, I was myself able to reduce the uncontrollable error still further, to 0.4 inch. The measurements from which this lowest estimate has been obtained are given in Table II; pairs of measurements on the same patient frequently differ by as much as $\frac{1}{2}$ or $\frac{3}{4}$ inch, but

TABLE II.

Replicate Measurements of the Puerperal Uterus by a Single Practiced Observer.

			Patients								Readings totals
			1	2	3	4	5	6	7	8	
Replicate	reading	1 ...	4.75	3.50	2.50	3.00	5.00	5.25	7.00	4.25	35.25
,,	,,	2 ...	4.25	3.25	2.00	3.00	5.25	5.25	6.50	4.75	34.25
,,	,,	3 ...	4.50	3.50	2.50	3.00	5.50	5.25	6.00	4.50	34.75
,,	,,	4 ...	4.50	3.50	2.00	3.25	5.00	4.75	7.00	4.50	34.50
,,	,,	5 ...	3.75	3.25	2.25	3.50	4.75	4.75	6.50	4.75	33.50
Patients' totals		... ...	21.75	17.00	11.25	15.75	25.50	25.25	33.00	22.75	172.25

THE ERROR OF MEASUREMENT AND FUTURE RESEARCH.

From time to time attempts have been made to show that administration of this drug or that drug assists uterine involution. Before any observed irregularity in the records of uterine shrinkage is admitted as evidence of the influence of special treatment, due allowance must have been made for the effect of the error of measurement. With one of the magnitude described, such attempts would be tedious and likely to give equivocal results. A substantial reduction in the error would increase the value

on only two occasions is there a difference greater than twice the error (0.8 inch), and never a difference greater than three times the error (1.2 inch).

DISCUSSION.

Five estimates of the error of measuring the puerperal uterus have varied between 0.4 inch and 1 inch. Careful measurement, by a single observer, is associated with the lower estimates: in contrast an error of 1 inch or more may be appropriate if measurements are made by different persons and with little attempt at accuracy.

Taking an intermediate figure, it may be claimed that, unless the height of the uterus is more than 1½ inches—twice an error of ¾ inch—greater than expectation, no cause other than the error need be sought. If the observed height of the uterus lies outside this range, one or a combination of the other three groups of factors must be responsible. An unrecognized pelvic tumour, suddenly elevating the puerperal uterus, would cause acute abdominal symptoms that would lead to the diagnosis. Leaving aside such a rare event, there remains as explanation either changes in the size of the uterus itself, or changes in the size of the bladder or bowel.

Uterine involution is a vital, continuous process taking place at a rate of about ½ inch per 24 hours, subinvolution being presumably any rate less than this. Because the error of measurement of the puerperal uterus can account for differences between two readings as great as 1½ inches—three times the average daily shrinkage—it seems clear that delayed involution cannot be recognized until a few days have elapsed. What then is the purpose of measuring the height of the uterus each day? The answer to this question is given by the knowledge that the commonest influences increasing the recorded height of the puerperal uterus are the distended bladder or bowel. The effect of the latter has already been described and illustrated,[2] that of the former is easily demonstrated.

In Table III the results of measuring the height of the uterus just before and just after a routine morning bed-pan round are tabulated. Fourteen normal patients were measured. From the difference column it may be seen that in every case the emptying of the bladder was associated with a fall in the height of the uterus, and that in 10 cases the difference was up to or greater than 1½ inches. With abnormal distension of the bladder the elevation will probably be greater than 1½ inches, in other words it will be outside the range that may be attributable to error.

TABLE III.

Measurements of the Puerperal Uterus of 14 Patients Before and After Micturition.

	Patients													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
First measurement	7.50	4.25	7.00	6.00	8.00	3.75	5.00	6.25	5.00	6.75	7.50	4.25	6.50	5.50
Second measurement	6.25	3.75	4.50	4.50	4.25	2.25	4.00	5.25	2.00	5.00	5.25	2.50	4.25	4.00
Difference	1.25	0.50	2.50	1.50	3.75	1.50	1.00	1.00	3.00	1.75	2.25	1.75	2.25	1.50

I believe, therefore, that the day to day measurement should not be used primarily to detect subinvolution but rather as a means of recognising abnormal fullness of bladder or bowel. Used in this way, the value of this routine is greatly extended. There is one further point of importance. Because the error of measurement is seldom less than half an inch, a height of uterus greater than that recorded for the previous day should be frequently observed. Hospital records that are consistently devoid of such apparent irregularities do not convey an impression of accuracy.

SUMMARY AND CONCLUSIONS.

1. The recorded height of the puerperal uterus is influenced by: (1) changes in the size of the uterus, (2) a pelvic tumour,

(3) a full bladder or bowel, and (4) a large group of factors each of which is largely uncontrollable in practice. Examples of the latter are: the thickness of the abdominal wall, the varying uterine tone, the location of points for measurement and different measuring techniques. Together these factors add up to make the error of measurement.

2. Examples of a method of obtaining an estimate of this error are described. The statistical details are given in the appendix.

3. Estimates of the error of comparing two measurements have varied between 0.4 inch and 1.0 inch. The lower estimates are associated with careful observation by one person: the higher ones are appropriate if daily readings are perfunctorily made by different persons.

4. Normal uterine involution starts quickly and finishes slowly. This changing rate is too cumbersome for the bedside; in practice during the first week, the average rate may be taken as $\frac{1}{2}$ inch a day.

5. The expected height of the uterus is, on the above estimate, $\frac{1}{2}$ inch less than that recorded on the previous day. Against this there will be an observed height for comparison.

6. Taking an intermediate estimate of error ($\frac{3}{4}$ inch) it may be said that unless the observed height of the uterus is more than $1\frac{1}{2}$ inches—twice this error—greater than expected, no cause other than the error of measurement need be sought.

7. When compared with the error of measurement the average normal daily involution is small, and the elevation of the uterus by an overdistended bladder or bowel is large. The routine day to day measurement should not, therefore, be used primarily to detect subinvolution but rather as a measure of the fullness of bladder or bowel.

Appendix.

The principles used in the extraction of the error and the detailed arithmetic of the first investigation are as follows.

Analysis of Variance.

The total variability of the 50 measurements (Table I) may be expressed by a "mean square."* This mean square is divisible (Table IV) into: (1) a mean square representing the variability of patients as illustrated by the Patients Totals row, (2) a mean square representing the variability of observers, illustrated by the Observers Totals column and (3) a remainder or mean square for error representing the variability caused by the interaction between patients and observers. In this example the mean square for error is 0.33 inches. The standard error of the difference between two measurements is therefore $\sqrt{0.66}$ inches or 0.8 inches.

Table IV.

Analysis of Variance of Uterine Measurements from Table I.

	Sum of squares	Degrees of freedom	Mean square	Variance ratio	Probability
Between patients ...	70.2800	9	7.8088	23.608	Less than 0.001
Between observers ...	9.0925	4	2.2731	6.87	Less than 0.001
Error	11.9075	36	0.3308		
Total	91.2800	49			

* Mean square = variance = (Standard Deviation)^2 = sum of squares of differences between measurements and their arithmetic mean divided by the degrees of freedom.

Sum of observations (Sx).....193.50
Number of observations (n)..... 50.00
Sum of squared observations (Sx^2).....840.125
The correction term $\left(\frac{S^2x}{n}\right)$..... $\frac{193.50 \times 193.50}{50} = 748.845$

Using the algebraic fact $S(x-x)^2 = Sx^2 - \frac{S^2x}{n}$

Sum of squares of differences between measurements and their arithmetic mean $S(x-\bar{x})^2$..... $= 840.125 - 748.845 = 91.28$

The sum of squares " between patients "
$= 1/5\ (22.75^2 + 23.50^2 \ldots\ldots + 18.75^2 + 29.25^2) -$ correction term
$= 819.125 - 748.845$
$= 70.2800$
The mean square " between patients " $= 70.2800/9 = 7.8088$.

The sum of squares " between observers "
$= 1/10\ (43.25^2 + 32.50^2 \ldots\ldots + 42.75^2) - 748.845 = 9.0925$.
The mean square " between observers " $= 9.0925/4 = 2.2731$.

The sum of squares " Error "
$= 91.2800 - (70.2800 + 9.0925) = 11.9075$.
The mean square " Error " $= 11.9095/36 = .3308$.

The Variance Ratio " between patients " $= \frac{\text{Mean square " between patients "}}{\text{Mean square " error "}} = 23.608$

From Fisher and Yates Tables 23.608 corresponds to a Probability (P) less than 0.001.

The Variance Ratio " between observers " $= \frac{2.2731}{.3308} = 6.87$ corresponding to a Probability (P) less than 0.001.

The standard error of the difference between two measurements $= \sqrt{0.33 + 0.33}$.
$= 0.8$ inches (approximately three-quarters of an inch).

Analysis of the " difference " column in Table III by a recognized method shows that $t_{13} = 7.8$. This corresponds to a Probability less than 0.001.

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A Case of Complete Placenta Praevia Accreta Occurring in a Primigravida

BY

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AND

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THE following case of placenta accreta is recorded, not only for its rarity, but also because of its occurrence in a primigravida, following curettage.

HISTORY OF THE CASE.

The patient, aged 27, was first seen by Mr. W. E. Barnie-Adshead in September 1942, when she attended the Out-patient department of the Women's Hospital, Birmingham, complaining of sterility. She had been married for 6 years, but had used contraceptives for the first 4 years. Menstrual history was normal. On examination her general condition was found to be good, and the pelvic organs normal, except for a small flat cervical erosion. As her husband was expecting to be sent abroad, and she was very anxious to have a baby, it was decided to dilate the cervix and insufflate the Fallopian tubes.

On September 12th, 1942, on the 8th day of the menstrual cycle, a general anaesthetic was administered, and the cervix was dilated by one of us (D.M.S.). The Fallopian tubes were insufflated, the right tube only being found patent. The endometrium was curetted and the cervical erosion cauterized. The patient was discharged after 5 days.

The patient was next seen on July 27th, 1943, at the Birmingham Maternity Hospital, to which she had been sent up by her doctor for a diagnosis of the presentation. Her last normal menstrual period was on October 13th, 1942. She had a threatened abortion in December, but otherwise the pregnancy was normal. She was now 1 week overdue. Examination showed a well-nourished healthy woman, blood-pressure 120/74, urine normal. The uterus was the size of a full-time pregnancy. Right occipito posterior position, foetal heart heard. The head was floating, and could not be pushed into the pelvis. An X-Ray examination confirmed the presentation.

The patient was seen again the following week, when the findings were as before. On vaginal examination the pelvis was found to be normal in size, but it was impossible to push the head down into the pelvis. A finger was introduced cautiously through the cervix, and the maternal surface of the placenta was felt overlying the os internum. There was no haemorrhage. A diagnosis of placenta praevia was made, the patient was admitted immediately and operated on the same evening.

A classical Caesarean section was performed by Mr. P. J. Ganner under general anaesthesia, and a live female infant, weighing 7 pounds 10 ounces, was delivered in good condition. The placenta was found

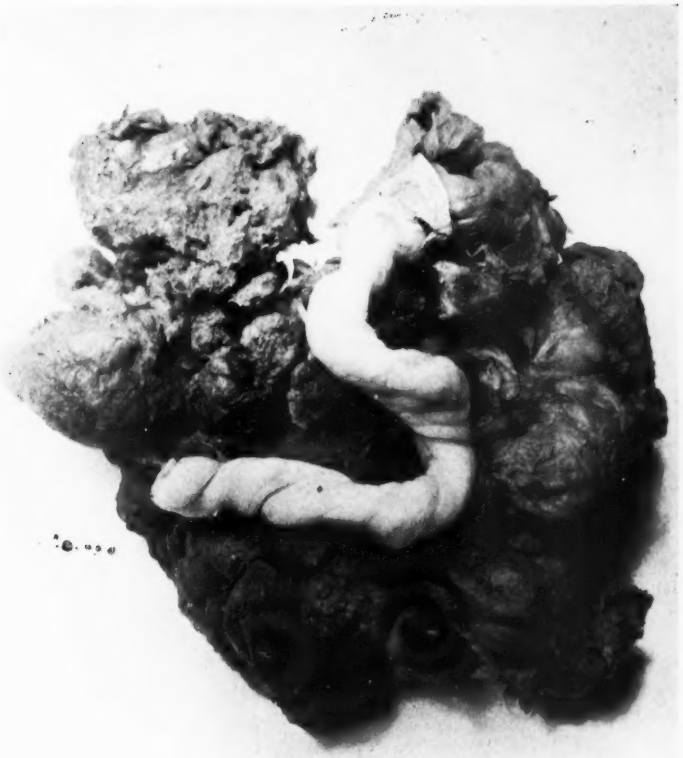

FIG. 1.

Ragged portion of placenta removed manually at operation.

S. & T.

FIG. 2.

Uterus showing remains of placenta fused to the myometrium of the lower segment and covering the internal os. Note extreme thinning of the myometrium at A.

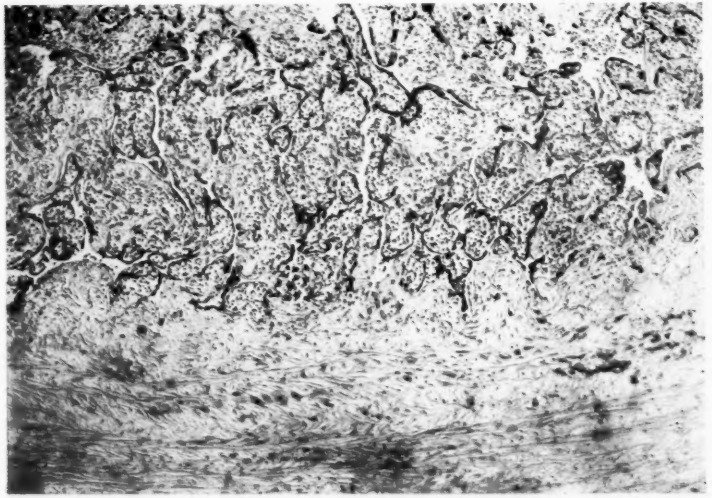

FIG. 3.

× 50. Section showing the chorionic villi (upper part of picture) fused to the myometrium (lower part of picture).

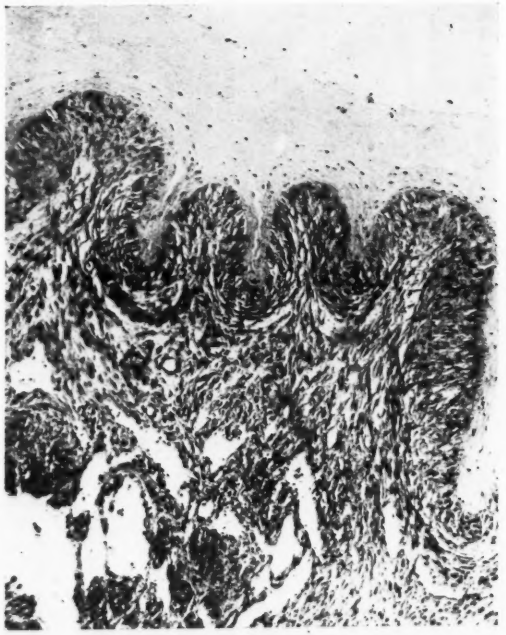

FIG. 4.

× 50. Low power view of the atrophic convoluted decidua vera. Note fusion to myometrium and absence of basal glands. The spaces in lower part of the picture are venous sinuses in the myometrium. (Compare with Fig. 6.)

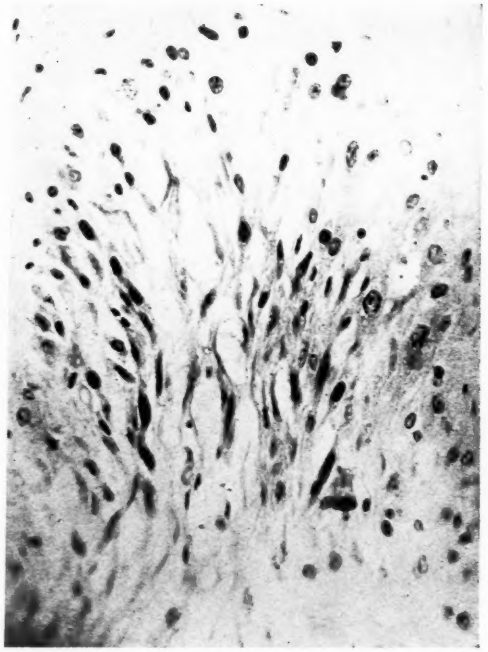

FIG. 5.

× 265. High power view of one of the convolutions seen in Fig. 4 showing fusion of the darker stained spindle-celled fibroblastic tissue to the paler decidua. S. & T.

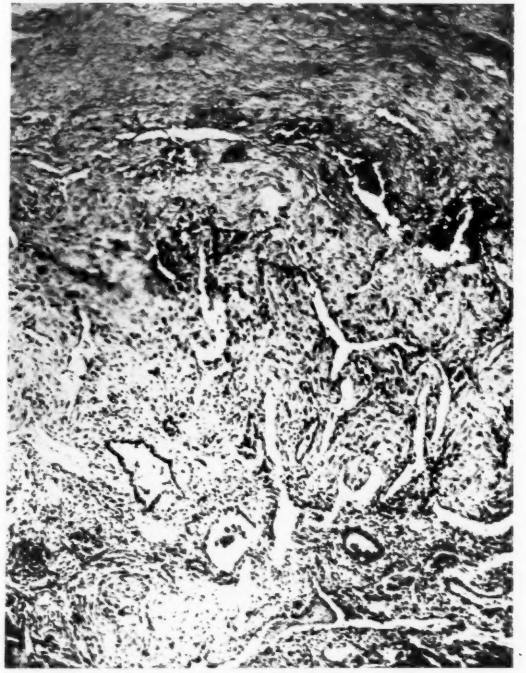

FIG. 6.

× 50. Normal decidua vera at term showing compact layer (A) spongy stratum (B) and basal glands (C)—the latter are lined by darkly-stained epithelial cells.

to be covering the os internum and situated completely in the lower segment which was much distended and covered with enlarged veins. Ergometrine was given intravenously, but though the upper segment contracted, the placenta failed to separate. There was no undue haemorrhage until a manual removal was attempted. It was then found that the placenta was morbidly adherent and about one third of it, including the umbilical cord, was removed with great difficulty. Haemorrhage was extremely severe, and the patient's condition deteriorated rapidly until her pulse was impalpable. A transfusion was started; 1 pint of plasma being given, followed by Group O blood. A total hysterectomy was performed with difficulty, owing to the haemorrhage and the great distension of the lower segment. The fundus of the bladder was opened accidentally and was closed with 2 layers of catgut sutures. The ovaries and Fallopian tubes were not removed. Two pints of saline were left in the peritoneal cavity, and the abdomen was closed in layers. A self-retaining catheter was left in the urethra.

The patient's condition was extremely poor at the end of the operation. The transfusion was continued, a total of 3 pints of blood and 1 pint of 10 per cent glucose saline being given, with improvement. After the first 24 hours her condition gave no cause for anxiety. Continuous drainage of the bladder was kept up for 10 days, after which the catheter was removed, and she passed urine normally. On the 3rd day, a blood count showed: R.B.C.s 1,570,000, haemoglobin 20 per cent. A further 2 pints of Group O blood were given. By the 7th day the haemoglobin had risen to 40 per cent. She had a temperature of 99–100°F. for the first 16 days. An offensive vaginal discharge was treated with douches after the 10th day. On the 14th day blood count showed: R.B.C.s 3,430,000, haemoglobin 45 per cent. She got up after 3 weeks and was discharged in a further 10 days. There was no lactation. The baby was discharged in good condition.

When seen 8 weeks after delivery, her condition was good, and there was no obvious anaemia. The abdominal and vaginal scars were soundly healed.

Pathology.

About one third of the placenta is detached from the uterus and shows a ragged, torn under surface; the umbilical cord is attached normally. (See Fig. 1). The uterus shows contraction of the upper segment, distension of the lower segment, and dilatation of the cervical canal. The remaining portion of the placenta is wholly in the lower segment as a central placenta praevia. The placenta is everywhere fused to the myometrium, separation being impossible without tearing the uterine wall. The latter shows extreme thinning beneath the adherent placenta, in one part measuring only a millimetre in thickness. (See Fig. 2).

Histological examination of numerous areas shows an absence of extreme atrophy of the decidua basalis. In most areas the chorionic villi are fused to the myometrium (Fig. 3); rarely a haemorrhagic spongy stratum extends for a few millimetres between areas of fusion. The chorionic villi show marked fibrinoid degeneration, and Rohr's stria is marked while Nitabuch's stria appears to be largely absent. In some areas muscle spurs can be seen projecting into the adherent chorionic tissue. The decidua vera is thinned, convoluted and shows absence of basal glands (Fig. 4): the compact decidua is fused to the myometrium by a thin layer of fibroblastic tissue, best seen in the convoluted projections (Fig. 5).

Discussion.

A complete review of the literature up to 1936 is given by Irving and Hertig,[1] who

analyse 86 previously reported cases and add 18 of their own. In 1942 Cunningham[2] published a further review and described 2 more cases. Several aspects of the present case seem worthy of discussion and comparison with the above.

Incidence.

The figures vary from 1 in 1936 (Irving and Hertig) to 1 in 20,000 (Krull[3]). Cunningham gives an incidence of 1 in 16,000. At the Birmingham Maternity Hospital a case of partial placenta accreta, with death from haemorrhage, occurred in 1939, but no other case has been encountered during the last 18 years, an incidence of 1 in 12,000.

Parity.

Most cases have been reported in multipara, and Irving and Hertig give an average parity of 5.6. The occurrence of this case in a primigravida is thus particularly interesting.

Pathology.

There is general acceptance that placenta accreta is due to absence of or abnormality of the decidua basalis, in particular of the spongy stratum which is the normal line of cleavage of the placenta; also that the decidua vera, where examined, shows abnormality. This is borne out in the present case. Penetration of chorionic villi into myometrium is not seen in the present specimen, but marked thinning of the uterine wall has occurred, a feature noted by many authors. The placental site is commonly abnormal. Jackson[5] recently reported a case of placenta praevia and accreta, and placenta praevia occurs in at least 14 per cent of recorded cases.

Aetiology.

Most authors consider that the cause of the imperfect decidua basalis is either:

(1) Trauma or infection associated with a previous pregnancy, or

(2) Previous operations such as severe curettage, involving trauma to the endometrium.

In the present case any abnormality arising from a previous pregnancy is excluded, and the only points which may throw light on the aetiology are:

(*a*) The history of sterility, and

(*b*) The history of a previous operation.

(a) *The History of Sterility.* This was of 2 years duration only, but the presence of a cervical erosion, together with the fact that contraceptives had been used for the previous 4 years, suggests that a mild form of chronic cervicitis was the cause. This is confirmed by the observation that conception occurred within 6 weeks of dilating and cauterizing the cervix.

(b) *The Previous Operation.* In the 85 cases reviewed by Irving and Hertig, curettage had been performed in 10 cases, and Schockaert called attention to the fact that excessive curettage might cause imperfect regeneration of the endometrium and subsequently of the decidua. In the present case neither the cauterization nor the curettage seemed to be excessive, and the fact that a normal menstrual period occurred after the operation shows that regeneration, in part at least, of the endometrium had taken place. However, the abnormal adherence of the decidua vera to muscle shows that the whole of the decidua was affected and not just that at the placental site. It is, therefore, feasible to suppose that the curettage had removed the basal layer of the endometrium from a considerable area of the uterus, and the advisability of routine curettage in cases of sterility is questioned.

Schockaert suggests that an endocrine dysfunction is the cause of the deficient decidua formation. There was no clinical evidence of any such abnormality in the present case, but as, unfortunately, the endometrium was not submitted for histolo-

gical examination at the time of the operation no definite conclusion was formed.

In this case, therefore, it seems that the cause of the placenta accreta was trauma to the endometrium from curettage. To this may be added the possibility of a cervicitis caused by the use of contraceptives. Kushner[4] records a case of placenta accreta in a primigravida who had had a previous myomectomy. The aetiological factor here also appears to be trauma to the endometrium at the time of operation.

Diagnosis.

This is impossible until failure of the placenta to separate calls for a manual removal. It is then found that there is no line of cleavage, and attempted removal leads to severe haemorrhage. In the present case if it had been possible to see the extreme thinning of the uterine wall the condition might have been suspected, but this was not obvious until part of the placenta had been removed. The tenderness over the placental site stressed by Cunningham was absent.

Treatment.

Hysterectomy is the only safe treatment for complete placenta accreta. Cunningham states that the mortality in patients treated by manual removal is 70 per cent, whereas after abdominal hysterectomy it is less than 6 per cent. Attempts at manual removal lead to such severe complications as inversion or rupture of the uterus and profuse haemorrhage, and only increase the risk when hysterectomy has to be performed subsequently. In the present case immediate blood transfusion undoubtedly saved the patient's life.

Summary.

A case of complete placenta praevia accreta in a primigravida is reported and the pathology described.

The aetiological factor appears to have been curettage for sterility.

Treatment by hysterectomy and the value of blood transfusion are stressed.

Our thanks are due to Mr. W. E. Barnie-Adshead, and Mr. P. J. Ganner, for permission to publish this case.

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2. Cunningham, John F. *Journ. Obstet. and Gynaecol. Brit. Emp.*, 1942, xlix, 149.
3. Kraull and Schockaert. Quoted by above.
4. Kushner. *Amer. Journ. Surg.*, 1941, xlii, 92.
5. Jackson, Ian. *Proc. Roy. Soc. Med.*, 1943, xxxvi, 7.

Childbirth in the Greek Island of Chios in the 6th Century B.C., 1780, and 1914

BY

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I HAVE the honour to bring to the notice of your readers the existence of two Greek terracottas belonging to the 6th century B.C., which are in the museum of Nicosia in Cyprus: a description of a confinement in Chios written in 1780, and a description of the labour chair used in Chios until 1914.

The two Greek terracottas, small votive offerings, are in the Museum at Nicosia in Cyprus (unfortunately I did not take their dimensions when I noticed them in 1930) and both are ascribed to the 6th century B.C. (This dating was given by the Director of the Museum, being based on the chronology of other articles found during the same excavations where these terracottas were unearthed). The one (Plate I) represents a woman being delivered of child in an upright seated position; she is held from the back by another woman, who has her hands clasped round her belly and who is probably pressing the infant downwards exactly as described in *The Expert Midwife* of 1637 and in Sonnini's description written in 1780 (Plate IV); in front and facing her in a kneeling posture is the midwife with her arms outstretched to receive the after-birth. The second terracotta (Plate II) is more coarsely modelled, and may be older; it represents a similar scene except that the seat on which the pregnant woman is reclining is missing and from the angle of the thigh it would appear to have been higher; also there is no trace of a third woman supporting from the back the woman in labour.

Both these votive offerings were presumably presented to the temple in honour of the god presiding over childbirth after successful confinements. There do not appear to be any such terracottas in the British Museum or in the Wellcome Museum.

These terracottas establish the fact that in classical times women were delivered in an upright perpendicular position, as is the case in the other relatively recent descriptions which we have now to consider, also that then in all probability some kind of special labour-stool was in use.

Before giving the English translation of Sonnini's account of a confinement in Chios in the year 1780 it is interesting for the sake of comparison to take in its chronological order an account of the use of the labour-stool as given in *The Expert Midwife* published in London in 1637.[1] that is to say roughly a century and a half earlier than the account given by Sonnini. We may conjecture that the same labour-stool was used at that period in England, for otherwise we may presume that the translator would have made a comment on what should have logically appeared to him to be a strange custom. The account reads as follows:

[p. 78] But what the Office of Midwives is in the time of birth, and how the action may proceed, we will now declare. First, let the midwife know the time, and observe the true pains and dolours, also let her comfort and cheare up the labouring woman, and let her chearefully exhort her to obey her Precepts and admonitions. Likewise let her give good exhortations to other women being present, especially to poure forth devout

[1] *The Expert Midwife . . . Six Bookes compiled in Latine by the industry of Iames Rueff, a learned and expert Chirurgion: and now translated into English for the general good and benifit of this nation.* London, 1637. Lib. 3, Chap. II. pp. 78-83 [of first pagination, which recommences at p. 192].

PLATE I

Method of Delivery in Greece, 8th century B.C.
Terracotta in museum at Nicosia in Cyprus.

P.A.

PLATE II

Method of Delivery in Greece, 8th century B.C. (?).
Terracotta in museum at Nicosia in Cyprus.

P.A.

PLATE IV

Method of Delivery of the after-birth in Greek Archipelago in 1780 (from Sonnini).

P.A.

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prayers to God, afterward to doe their duties at once, as well as they are able. Which done, let her bring the labouring [p. 79] woman to her Stoole, which ought to be prepared in this fashion. [Here follows illustration, see reproduction, Plate III]. Let the Stoole be made compass-wise. underpropped with foure feet, the stay of it behind bending backward, hollow in the midst; covered with a blacke cloth underneath, hanging downe to the ground, by that meanes that the [p. 80] labouring woman may be covered, and other women sometimes apply their hands in any place if necessity require. Let the Stoole be furnished and covered with many cloths and clouts at the back and other parts, that the labouring woman receive no hurt, or the Infant any where, strongly kicking and striving because of the paines, stirrings, and motions of the mother. And after the labouring woman shall be set in her Chaire

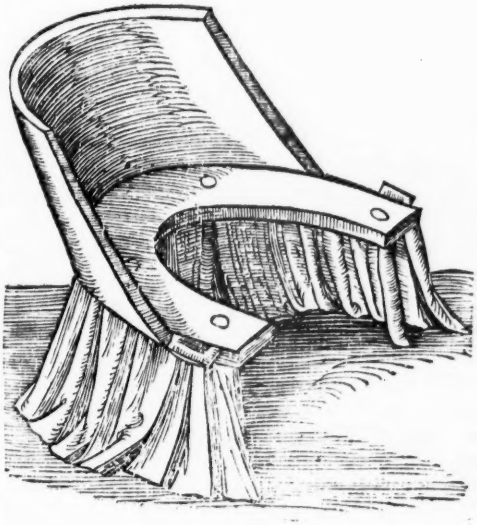

PLATE III
Delivery stool as shown in *The Expert Midwife* (1637).

about to be delivered, the Midwife shall place one woman behind her back which may gently hold the labouring woman, taking her by both her armes, and if need be, the paines waxing grievous, and the woman labouring, may stroke and presse downe the wombe, and may somewhat drive and depress the Infant downward. But let her place other two by her sides, which may both with good words encourage and comfort the labouring woman, and also may be ready to helpe and put to their hand at any time. This being done, let the Midwife her selfe sit stooping forward before the labouring woman, and let her annoint her owne hands, and the womb of the labouring woman, with oile of Lillies, of sweet Almonds [p. 81], and the grease of an Hen, mingled and tempered together. For to doe this, doth profit and helpe them very much which are grosse and fat, and them, whose secret parts are strict and narrow, and likewise them which have the mouth of the Matrix dry, and such women as are in labour of their first child. It will also be profitable to commixe and temper with those things the white of an Egge. Lastly, all these things thus prepared, let the Midwife instruct and encourage the party to her labour, to abide her paines with patience, and then gently apply her hands to the worke as she ought, by feeling and searching with her fingers how the child lieth, and by relaxing and opening the way and passage conveniently for him, while the mother is in paine, and also where there is need by enlarging and stretching out the neck of the Matrix warily, and if the Infant stay from proceeding forth, and be stopped any where, with her fingers tenderly to direct the Infant to lie and proceed forth directly and naturally, when hee lieth crooked and overthwart, and to further him to an easie birth. Let her conveniently receive the Infant proceeding forth to birth, and let her presently [p. 82] cut the Navell. . . .

With the above picture in mind we may now pass to the detailed description of a confinement in Chios in the year 1780, when Sonnini visited the island. When reading this extract we should remember that the author was not a doctor, as was the author of *The Expert Midwife*, but an equally educated person who had received a legal training and had subsequently held many administrative posts in the French colonies. He was a man of means, of influence political and other, he had travelled extensively, he possed a keen power of observation and kept a detailed diary, in which he wrote every day accounts of what

he saw, and which he finally published in book form in 1801.[1]

If one were to examine the Greek of the Archipelago at the most solemn moments of his private life, one would always see him beset with the absurd fantasies of ignorance, doing the most weird things with as much good faith as serious thought. At birth he is surrounded with all the pageantry of superstition, and he remains in its company throughout his life. The attendant circumstances with which he arrives into the world are too curious for me not to make a special mention of them. [Sonnini had obviously not read *The Expert Midwife*!] One has every reason to express surprise that amongst the great number of travellers who have visited the Levant, and especially the islands of the Archipelago, not one of them appears to have been familiar with the methods practised at a confinement and which are certainly most extraordinary and no doubt are not of a character that our [French] women would care to adopt. I had the opportunity to attend a confinement of a young woman and, as I am the first to record it, I will enter into details on the subject that is so all-absorbing for the history of man [See Plate IV].

I should like first of all to mention that the young woman whose confinement I attended was not more than eighteen years old; she was tall, well made, with a strong constitution, and of a beauty that would have made the Greeks of antiquity envious. The preliminary and indicative pains of labour appeared at supper time, the young woman was taken into her bedroom and I had the permission to follow her. The midwife was very old and enjoyed the reputation for great knowledge and experience; she arrived accompanied by an assistant, who was nearly as old as she was herself, but with a less striking appearance and her features not being so regular. An artist wishing to paint a sybil could not have made a better choice for a model; everything about her announced a witch and her replies to questions that I asked could pass on account of their obscurity for pronouncements of an oracle. She also had with her a kind of tripod, of which I soon saw the use, but which proved to be what I was least expecting; this curious piece of furniture is not made of one piece of solid wood. Two round pieces slightly convex on the outside meet at an acute angle and support at their juncture a flat piece of wood suitable for sitting upon; all round the wood are wrapped and twisted old pieces of linen in not too elegant a fashion and this in turn is held up and rests on three very low legs which are also most coarsely fashioned, one of which supports the small saddle at the angle and the other two are placed under the arms at their extremity. The first care of the midwife was to open the locks of the doors, of the chests, of the trunks, and of everything in the house that had a lock. This was a necessary ritual, if one wanted the delivery to have no complications; and as a corollary of this absurd [p. 82] superstition only married women may be present, the unmarried being strictly excluded. I was also informed that, if I wanted to be present, I must decide to remain in the room until the delivery had been completed. This is a rule that nobody may infringe. Immediately labour begins those who are in the house may not go out and those who are outside may not enter. The former are considered to have contracted a form of taint, which deprives them of all communication with other persons, until a priest, who will have been advised on this score, should have come and blessed them and cleansed them from the impurity that they imagine they have contracted.

However, nature began to act; the efforts she provokes to hasten the birth of a new being multiply and the period of time between the labour pains lessens; everything indicates an easy labour and a happy confinement. During the course of this psychological action of the child on its mother she does not remain inactive; she was being urged to walk ceaselessly up and down in her room; if the pain or lassitude or despair should cause her to desire to rest for a moment, the two old cronies supported [p. 83] her under the arms and forced her to walk; and it must be admitted that she appeared to have no desire to walk. As soon as the great labour pains made themselves felt, she was made to bend and to double up in front of her bed and the midwife took up her position behind her and pressed her belly hard with both hands until the pain had passed, and this did not take long; then the walking recommenced, until a recur-

[1] C. N. Sonnini de Manoncourt, *Voyage en Grèce et Turquie faict par ordre de Louis XVI.* A. Paris, An IX [= 1801].

rence of the pains brought the woman to need further pressure on her belly from the midwife. . . .

[p. 92] During the time when I was in the room of the young Greek woman in labour, I asked the old midwife various questions on her profession; I asked, for example, what she did in cases when the child was badly placed. She assured me that such an eventuality hardly ever presented itself, but, when it did, she tried to turn the baby into its proper position and that, were she not to succeed, she had recourse to a method which always extricated her from the difficulty [p. 93]: that was to call the husband, who in the opinion of the women of this country possesses in particular the power to remove all obstacles that oppose themselves to the delivery of his wife; and this magic power consists in the husband striking his wife thrice on the back with his shoe and at the same time pronouncing the words "I loaded you, now I discharge you."

When the critical moment arrives, the young woman is placed on the fateful tripod; in the description that I gave of this sort of seat, I indicated the positon of the woman; an air of frankness and uneasiness made her appearance most interesting, and her features—a delicate outline of youth and beauty—did not seem changed by the pains. The midwife took up her position in front of the patient at a slightly lower level and her assistant sitting behind on a chair rather higher than the labour-stool placed her arms round her waist.

The child was not long before making its appearance; and as soon as it was separated from the afterbirth, the assistant by a vigorous movement of the arms lifted and bumped the patient up and down perpendicularly over the tripod and let her drop again on to it with a jerk. I [p. 94] could not get over my amazement to see this woman, who had just been delivered of child, being subjected to a manipulation that appeared to me as absurd as it was revolting; she was thus remorselessly shaken until her delivery was complete, and fortunately this did not take long. This violent procedure is a common practice and Greek women consider it to be indispensable to complete the delivery; and accidents very seldom result, although one might think that many would be occasioned. . . .

[p. 95] I was surprised to see that the patient in no way complained and after the experience, that had appeared so cruel, walked unattended to her bed with absolute ease without showing signs of weakness or fatigue. A few moments of rest enabled her to appear in an unhoped for condition; the colour in her cheeks was a little less marked, but she was still rosy; with geniality she received a host of congratulations and she replied as if she were in a most placid condition.

I should like to follow up with the treatment which is applied to women after their confinement; it is the following: Immediately after the delivery the woman is bound with a wide linen bandage from the breasts to the kidneys [*depuis le sein jusqu'aux reins*, i.e. from just below the breasts to the top of the pelvic bones]; the bandage is applied tightly. Here in Europe our practise decries such a treatment and disapproves of a bandage. "Any outside pressure on the belly of a woman delivered of child is very dangerous owing to the inclination of the [p. 96] abdominal cavity to inflammation. The weight of a child during nine months of pregnancy, the successive contractions of the womb, whence the violent labour pains of childbirth, irritate this viscus and inflame it; any pressure in consequence can but be fatal to the woman in childbirth." [Extract from a letter from a famous doctor of the period, Sacombe, to the author Sonnini]. No doubt a learned theory has revealed the inconveniences of this method; but for the Greek women they are but chimera of fancy; for they withstand with as much impunity the pressure of the bandage with which they are bound as they do when they face the dangers of the jolting on the labour-chair. On the contrary they are conscious of the advantage, namely that they thus preserve their good figures, which a multitude of women in other countries might easily envy. It is to avoid the usual excessive swelling of the belly or, what is still more disagreeable, the numerous folds and the furrows of deep wrinkles.

On the first day the midwife bandages the patient after having applied dried rose leaves, which previously she boils in wine and honey. After many ablutions of this mixture the rose leaves themselves are applied until the following day. On the [p. 97] second day and the days following they confine themselves to simple fomenting, applied with cotton soaked in hot wine and then are applied alternatively powder of cinnamon,

clove, nutmeg, or cumin; let it be understood that only one of these aromatic powders is applied at a time and that each time the bandage is changed.

Instead of wine, which they use only in cases of delicate women, they usually employ brandy, which makes the application burn more and is more painful. Whatever may be the condition of the patient, whether her recovery is in advance of the usual or whether it is retarded, the same method of bandaging is continued, morning and evening. It is interesting to note that at each of these bandagings the midwife gets on to the bed of the woman she is attending, lying in the opposite way with her head resting on the foot of the bed and with her legs stretched between those of the patient, and clasps the patient's hands in hers and with one foot she jolts violently three times the parts that have suffered, pressing her foot upon them as hard as she can.

On the eighth day they hard-boil an egg, remove its shell, sprinkle it with some aromatic herb powder, and fasten it with bandages on the place where the midwife pressed her foot; it is left in that position for two to three hours. The object of this procedure, according to what the midwife seriously informed me, is to attract any cold that the patient might have contracted; this is the last attention of the midwife, after which she leaves the case.

[p. 98] The linen that has been used at a confinement must not [p. 99] be washed in sea water, although the inhabitants of the Archipelago use little else for laundering; they are persuaded that, were they not to deviate from their custom, the mother would die. She must also not be seen by any star; and if she goes out four or five days after childbirth, which is customary, that is to say before her treatment is ended [treatment is continued until the eighth day, see above, Sonnini p. 97], she must be careful to shut herself up in her room at sunset and under no pretext whatsoever must she open either door or window in case a star surprise her and according to their superstition spell death to both mother and child.

The first time a woman leaves her bed after giving birth to a child, and places her feet on the ground, she must step on a piece of iron, so that according to the superstition she may become as strong as this metal. Also she may enter no house without throwing on to the threshold a key or some other pieces of iron, on which she must necessarily tread, if she wishes [p 100] to avoid introducing the baleful influences with which she is considered to be surrounded.

[p. 100] As soon as a child is born it is washed with tepid water; it is then covered from the feet as far as the neck with a layer of salt, which is regarded as a sure preventative against worms and skin diseases. After having wrapped it in swaddling clothes, it is laid down and a loaf of bread and a pestal or some other kind of fashioned wood is placed beside it; the loaf is to prevent the child suffering from hunger throughout its life and the effect of the pestal is to make it as quiet as a piece of wood. In other parts of the Levant the mother holds her new-born and the midwife takes a bronze mortar and bangs it fairly hard three times near the ear of the child, in order, so they maintain, to open its acoustic organ and to make it immune against deafness.

From what Sonnini writes we may definitely deduce that at the close of the 18th century the labour-chair was no longer in use in France. Finally is added an illustration (Plate V) of the labour-chair which was in use in Chios until about 1914.

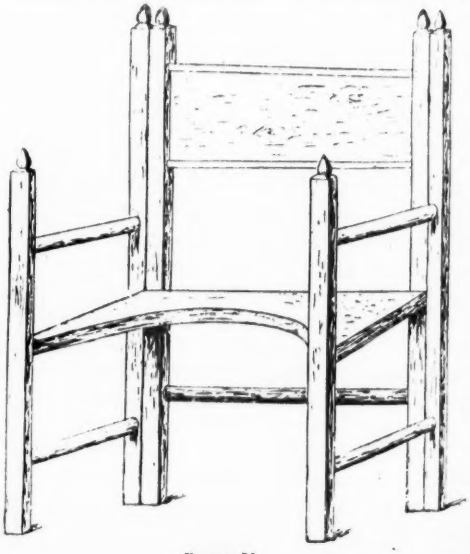

PLATE V

Delivery stool in use in Chios up to 1914.

It will be noticed that it was higher than the tripod represented by Sonnini and has a back in accordance with the ideas expressed in *The Expert Midwife*, but instead of being concave to fit the curvature of the body it is straight like an ordinary chair.

In Chios doctors only took over, so to speak, from midwives about 1914. I have been given there the following information by an old woman who had practised midwifery in the island for many years before retiring.

As there were no means of communicating in Chios except for a few inferior roads, the midwife went on her round on mule-back generally accompanied by an assistant, who for choice would be her daughter and successor-elect to her practice; on one side of the mule was strapped the labour-chair, which folded up, having heavy hinges behind the seat and at the junctures of the arms and back. For padding, shaped cushions were tied to the different parts of the chair. The pregnant woman was seated in the chair and, in order to bring on the child, was jolted up and down from the back by the assistant, who held her under the arms; if the woman was heavy then the jolting was carried out by one of the women members of the family who helped by holding the woman under the left arm with her right hand and the midwife's assistant doing likewise on the right side with her left hand, thus leaving the right arm of the more experienced free for pressing down the belly of the expectant mother. The midwife's position was exactly similar to that of the one represented in the terracottas dating from 600 B.C. The midwife's after-treatment continued for 8 days after which the mother was considered to be in a condition to resume her normal life.

In captions under Plates I and II " 8th century B.C. " should read " 6th century B.C."

Vesicovaginal Fistula, Foreign Body and Calculi in Bladder following Attempted Criminal Abortion, and Normal Labour

BY

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UNUSUAL and unexpected sequelae of attempts at procuring abortion, whether successful or not, are common enough, but take place, as a rule, within a comparatively short time after the attempt has been made. If the attempt is successful the abortion and the sequelae all occur as different stages of the same illness. If the abortion does not take place, and if the patient recovers from the immediate results of the unsuccessful attempt to procure it, she may go to term, delivery may be normal, and there are usually no postpartum complications referable to the attempt at procuring abortion, which may have been made several months previously.

The train of events which occurred in the case now described, however, were quite the opposite from the above, as may be gathered from the title of this paper. The history is as follows:

On May 14th, 1943, Mrs. H. C. was admitted to Mayday Hospital, Croydon, suffering from incontinence of urine of 2 weeks' duration, and she had been feeling ill for several weeks before its onset. She was a 3-para, the last child being born on December 21st, 1942. The labour was normal, the child weighed $5\frac{3}{4}$ pounds and survived, and the puerperium was uneventful.

She stated that in September 1942, at the 5th month of pregnancy, she made an attempt to procure an abortion by inserting an ordinary lead pencil, about 5 inches long, into the uterus. She did not feel any pain during the attempt, there was not any loss, the pencil disappeared and was not seen again. The pregnancy remained undisturbed, and her general health was unaffected.

On December 14th, 1942, at about the 37th week of pregnancy, she attended an antenatal clinic for the first time. She was apparently in good health, and was not complaining of any pain. During the examination, however, a swelling was noticed in the lower part of the uterus, which was stated to feel like a foreign body. No steps appear to have been taken about it at that time. A week later she was admitted to the same hospital in labour, and, as already stated, delivered herself of a live child, labour and lying-in period being uneventful. She remained quite well for 3 months after discharge from hospital.

Examination in Mayday Hospital revealed a very thin and pale woman. The tongue was coated and the breath fetid. The abdomen was scaphoid, but there was no tenderness on palpation. On making a vaginal examination, the labia were found to be very inflamed, and foul-smelling urine gushed out. The end of the pencil was felt protruding into the vaginal vault through a vesico-vaginal opening just below the cervix, about an inch being palpable.

There was considerable pain during this examination, and the condition of the cervix and body of the uterus could not be made out.

The following results of examination of the blood and urine were obtained:

Haemoglobin 51 per cent; blood urea, 43 mg. per 100 c.c. Catheter specimen of urine: Reaction alkaline, sugar absent, albumin 0.2 per cent.

Microscopic examination: Fairly large numbers of white-blood corpuscles; small numbers of epithelial cells and red-blood corpuscles; no casts.

Culture: Profuse growth of B. coli and Strep. faecalis. Blood culture was negative after 96 hours' incubation.

The temperature was 103.6; pulse-rate 132; respirations 22.

The day after admission the vagina and bladder were explored under general anaesthesia. One end of the pencil was identified in the vaginal vault, together with the opening into the bladder through which it protruded, about an inch in front of the cervix. The other end was identified in the bladder by passing a sound.

An attempt to withdraw the pencil into the vaginal vault after grasping it with heavy forceps failed. It was now obvious that the part lying in the bladder was encrusted. The anterior vaginal wall was now incised forward from the anterior margin of the fistula for about 2 inches, the incision being carried through the base of the bladder. The protruding end of the pencil was again grasped, and easily withdrawn into the vaginal vault, the portion which lay in the bladder being completely buried in a hard deposit of phosphates, shaped roughly like a flattened pear, one surface being convex, and the other flat and facetted. Closer inspection of the wood showed it to be the half of a pencil split longitudinally, the groove where the graphite had been situated being plainly visible, but facing away from the facetted surface. On passing a finger through the opening into the bladder, the other half of the pencil, similarly encrusted, was located and withdrawn. It was identical in shape with the other, but slightly smaller, the phosphatic deposit being hard, convex on one side and facetted on the other. The groove in the wood again faced away from the facetted surface.

Further exploration of the bladder revealed only some phosphatic sand, which was washed out. The incision in the vaginal wall and base of the bladder was then closed up to the fistula with interrupted catgut sutures, but the fistula itself was not dealt with, as it was thought than any immediate repair would break down owing to the urinary infection. A De Pessar self-retaining catheter was placed in the bladder via the urethra.

Sulphapyridine was administered, and the condition of the urine improved rapidly, being free from albumin and pus on the 12th day. The temperature became normal about the same time and the patient's general condition improved remarkably. Drainage through the catheter, however, was never satisfactory, most of the urine being passed *per vaginam*.

On June 21st, 36 days after removal of the foreign body and the calculi, when the urine had been free from albumin and pus for nearly 4 weeks, repair of the fistula was undertaken, under a spinal anaesthetic (heavy Nupercaine, 2 c.c.).

A bladder sound was first passed via the urethra, and carried through the fistula into the vagina, thus defining the opening. The incision made into the anterior vaginal wall and the base of the bladder at the first operation was found to be completely united. An ellipitical incision was now made through the vaginal wall, enclosing the scar tissue of the margins of the fistula. The vaginal wall was reflected off the

underlying base of the bladder, after which the whole of the fistulous track, together with the elliptical area of vaginal wall and the portion of the base of the bladder involved, were excised. The opening in the bladder wall was then united by a continuous catgut suture. Before proceeding further, some indigo-carmine was injected into the bladder, but a leak through the base of the bladder was not seen. The vaginal walls were then brought together over the bladder suture line, first by 2 mattress-sutures, and finally by a continuous overrunning suture, all of catgut. A self-retaining catheter was placed in the bladder, and the vagina firmly packed with dry gauze.

From now on there was no further drainage of urine from the vagina, the bladder being kept empty by the self-retaining catheter for 9 days. The catheter was then removed, and 6-hourly catheterization for 2 days, followed by 8-hourly catheterization for 2 days, was substituted. The patient then began to micturate normally, remained completely continent, and was discharged on July 7th. Her general health appeared to be fully restored, and she put on weight rapidly.

Further examination of the calculi showed that when the two facets were placed together they fitted perfectly, forming a mass $2'' \times 1\frac{1}{2}'' \times 1\frac{1}{4}''$. The two halves of the pencil, however, lay in their respective calculous coverings with the grooved surfaces facing away from each other, showing that the pencil must have become split down the centre before the deposit of phosphates began to be laid down. As the patient assured me that she inserted it entire, the separation into two halves must have been brought about by the action of the urine on the glue. It is fairly certain that it was inserted into the bladder *via* the urethra, not into the uterus, as intended, which would explain the absence of pain and bleeding at the time. It is remarkable that its presence was not revealed for 7 months, during which time an almost full-time normal labour and an uncomplicated puerperium occurred.

Acknowledgments are due to Dr. Oscar M. Holden, Medical Officer of Health, County Borough of Croydon, for permission to record the notes of the case.

BOOK REVIEWS

"Caesarean Section: The History and Development of the Operation from Earliest Times." By J. H. YOUNG. London: H. K. Lewis & Co., Ltd., 1944. Price 16*s.*; 254 pages.

THERE are few operations which attract an audience so readily as that of Caesarean section. It never seems to lose its appeal to the dramatic in the spectator. Most audiences are more or less ignorant of the history of the operation which so commands their interest. They see the quick, well ordered, easily performed lower segment Caesarean section of to-day with its commonly successful result for both mother and child. Could they but realize that they were witnessing, after centuries of struggle against overwhelming odds, a degree of success undreamed of by the pioneers, how much greater would be the thrill experienced.

In this book Dr. Young has not merely collected a few historical facts, but, in a most thorough and painstaking fashion, has traced the development of Caesarean section from the mists of mythology through its vicissitudes to the achievement of the present time. It is most complete. The author has spent much time in diligent and patient determination to make his work exact and complete, as can be observed by the bibliographies at the end of each chapter or section. Although encyclopaedic, interest is maintained throughout the book, while even the most casual reader could not fail to be entertained by many of the astonishing incidents which are recorded.

The author approaches the subject with the customary division into three periods of time, prior to A.D. 1500, from 1500 to 1876, and from 1876 onwards.

How the operation got its name he cannot tell, but he supports the generally accepted view that it has no connexion whatever with the birth of Julius Cæsar. He tells us that the first to use the term "section" in connexion with this Caesarean operation was Jacques Guillimeau (1598) in his book on midwifery. An English translation (1635) of this does not suggest that that term was even then new. The subject is likely to remain obscure.

The plight of a woman in obstructed labour before 1876 was truly pitiable, and if she lived there was the dreadful probability of future distress. It is not surprising that the results of Caesarean section were bad in pre-Listerian days, and when the uterus was left unsutured. The marvel is that any subjects lived at all. The story from Trautmann's success in 1610 until the introduction of the Porro operation differs little from that of any other great advance in medical science. The steady line of progress goes on, sometimes very slowly, often fogged and obscured by unreasonable opposition, and embittered by personal feuds and squabbles. Such, too, we find, is the story of Caesarean section.

The author mentions the names not only of the doctors concerned, but of many of the tragic women at whose expense experience was gained. He also deals interestingly with the early ethical and religious problems arising from the performance of the operation, considered both by accoucheurs and divines.

The first three chapters are purely historical while the remainder of the book, except for a chapter devoted to postmortem Caesarean section, deals with the development of operative technique, indications and contra indications. Throughout these remaining 11 chapters the plan of each remains historical, but the history being evolutionary involves many technical details. The first of these is devoted to that short-lived portent, the Porro operation. The death-rate had begun to fall. From a mortality of 85 per cent in 1877 the death-rate fell in 7 short years to 35 per cent in 1883. No such mutilating operation, however, could be expected to endure.

A stimulating chapter is devoted to the

development of the "classical" operation, its preoperative technique, the abdominal incision, the uterine incision and the extraction of the uterine contents, the early efforts to suture the uterine wound, the "Sanger" operation, and the treatment of the abdominal wound. The later development of the lower segment and extraperitoneal operations, too, is reviewed in a masterly and painstaking fashion. The author has resurrected much valuable information, and well-deserved credit is given, where due, to those early thinking men who made suggestions, which were taken up decades and sometimes centuries later by others, to result, when perfected, in modern practice. These chapters illustrate the Osler dictum, quoted in the foreword, that "by the historical method alone can many problems in medicine be approached profitably."

The modern indications for the operation receive attention and a balanced view is obtained of the ever widening relative indications, with a timely word on the abuse of Caesarean section. Its place in placenta praevia and lack of place in eclampsia are discussed. The author appears to imply a prejudice against the lower segment operation for placenta praevia with which most obstetricians would not agree. There is a note on the Portes operation—"dreadful to contemplate." Chapters on postmortem Caesarean section and sterilization bring the book to a close.

The most striking omission in this exhaustive treatise is the apparent lack of interest in anaesthesia. In the remarkable operation seen by Felkin at Katura (page 11) the patient was semi-intoxicated with banana wine; there is a casual reference (page 181) "that Greenhill employs local anaesthesia": but "anaesthesia" is not even mentioned in the index. A chapter devoted entirely to anaesthesia would have been a welcome addition.

Purely verbal description of operative and applied anatomical detail is sometimes difficult to follow. Occasional simple explanatory line-drawings would have enhanced such portions, e.g., in describing the various methods of repair of the uterine incision, particularly such as are not now in common use.

The very thoroughness of this survey necessarily involves the mention of names unfamiliar to many readers. Footnotes giving very brief particulars of a person, when the name is first mentioned, would have added to the interest of the reader. Profusion of names and facts can be a little bewildering. It is perhaps a pity that a chronological table of events, outstanding either in interest or importance, has not been included.

There are a few mistakes, e.g., 1727 on page 30 should be 1627: "while the uterus is undergoing evolution" (page 236) obviously should read ". . . involution." Some inaccuracies in references are to be seen. Yule, G. W. (postmortem section) in *Trans. Edin. Obstet. Soc.*, is given as 1925 instead of 1926; Spencer, H. R. "Caesarean Section" London, is wrongly dated 1923 instead of 1925; Boley, J. P. *Canad. Med. Assoc. Journ.*, is given as XXV, 537, 1935, instead of XXXII, 557, 1935. Newell, F. S. "Caesarean Section," London, is dated 1931 in the text and 1921 in the Bibliography.

Despite these criticisms the author is to be congratulated. Such exhaustive reviews of the literature are most valuable, making easy of access important contributions which, with the passage of time, inevitably tend to become lost. The attention of every practising obstetric surgeon should be drawn to this book.

ANTHONY W. PURDIE.

REVIEWS OF HOSPITAL REPORTS

THE present paper shortage precludes any but the most brief review of hospital reports.

The Sixteenth Annual Medical Report of the Glasgow Maternity and Women's Hospital is comprehensive, and with such a wealth of clinical material to draw upon, cannot fail to be interesting and instructive.

Seventy-five per cent of the 4,379 patients admitted were abnormal cases. The explanation offered for the extraordinarily high incidence of abnormality is the type of population served, with reference to malnutrition and rickets. Fifty-nine maternal deaths seems an alarming figure for a relatively small number of deliveries, and rather points to the urgent need for improving nutrition and antenatal care in this area. The number of beds alloted to antenatal supervision is above the average, which is a favourable feature.

One wonders whether a " White Paper " medical service will improve these conditions. The details of the individual cases only serves to emphasize the need for improvement in public health generally, and prenatal care in particular.

O. LLOYD

The Woking Maternity Home Report records the figures for the first complete year in the new buildings, during which 841 patients were delivered, with one maternal death. The latter is the subject of special comment, which suggests the patient died from haemorrhage, although 2 pints of blood were given. It must be unusual nowadays for a central placenta praevia to be treated other than by Caesarean section, and one feels that this step and more blood might have produced a favourable result. The report pays tribute to the work of Dr. Harold Waller, whose suggestions have been put into practice with favourable results with regard to lactation problems.

This report would be improved by the omission of various vague terms: e.g. renal pain is tabulated as a maternal disease, labour is induced for " niggly pains," and in cases of "high head " no indication is given whether real or apparent disproportion was present. The method of induction employed is not mentioned.

These examples may serve to stimulate the compiler to aim at improving the report in the future.

THE REPORT OF ST. PHILOMENA'S MISSION HOSPITAL AND DISPENSARY, BANGALORE, BRITISH INDIA,

For the Year ending 31st March, 1943.

DURING the year 577 maternity cases were delivered, an increase of 203 cases over the previous 12 months.

There were 2 maternal deaths; one due to profound anaemia, a hopeless case when admitted, and she died a few hours later just after delivery. The other death was due to pneumonia. She lived in the sepoy line opposite and was delivered unattended, suddenly, at her home, but was admitted to hospital immediately after. She developed high fever that night with the signs and symptoms of pneumonia, but notwithstanding sulphonamide therapy she died 20 days later.

One patient developed small-pox 2 days after delivery. She was immediately taken home and made a good recovery. The hospital staff and all the patients and their babies were at once vaccinated, and happily no further cases developed.

Two cases of hydatidiform mole were successfully treated. These were the first we have had at St. Philomena's and strangely both in the same year.

There were 3 cases of melaena neonatorum among the infants, but all made a good recovery under treatment.

The neonatal deaths were due to prematurity, the infants dying a few hours after delivery with

the exception of 2. The latter were probably due to post-maturity. Labour was easy but the liquor amnii was full of meconium and the children died a few hours later.

One case of eclampsia was successfully treated. As a rule we do not admit such cases as we have no means of isolation and quiet. But in this case the initial fit occurred a short time after admission, and it was then difficult to send the patient elsewhere, as it was late at night, however mother and baby both made a good recovery.

During the year 24,538 patients were treated at the dispensary, and some minor operations were done. The hospital contains 14 beds.

We thank the Municipality and other benefactors for their financial help, as without this help we would not be able to carry on our charitable work.

INPATIENTS.

Total deliveries 577.

Full time	535
Premature	14
Miscarriages	11
Abortions	15
Hydatidiform mole	2
	577

Patients:—

Hindu	353
Indian-Christian	103
Mohammedan	45
Anglo-Indian	76
	577

Maternal deaths 2.

Babies born 550.

Twins	7
Stillborn	21
Neonatal deaths	10

Presentations:—

Vertex	533
Breech	12
Footling	1
Transverse	2
Face	2

Complications:—

Accidental haemorrhage	4
Postpartum haemorrhage	2
Placenta praevia	1
Hydatidiform mole	2
Adherent placenta	2
Procidentia uteri	1
Eclampsia	1
Albuminuria	2
Hydramnios	4
Foetal ascites	1
Prolapsed cord	2
Prolapsed arm	1
Collapse	1
Anaemia	73
Pneumonia	1
Smallpox	1
Amoebic dysentery	1
Bac dysentery	13
Talipes	1
Melaena neonatorum	3
Macerated	8

Operations:—

Forceps extraction	14
Internal version	2
Episiotomy	9
Induction of labour	4
Suture of perineum	45
Manual removal of placenta	1
Mojon-Gabaston technique for placenta removal	1
Lumbar puncture	1
Circumcision	3

INDEX TO CURRENT LITERATURE

In this Index an endeavour will be made, so far as war conditions permit, to maintain an up-to-date record of all titles bearing on obstetrics and gynaecology and the infant. The classification aims at making immediately available for the reader the titles under the various subject headings. In the majority of instances the title is obtained from the original publication. Where this has been impossible, the title has been obtained from the abstracting journal shown in brackets. Reprints will be welcomed and should be sent to the Editor.

Any inquiries should be addressed to Miss D. F. Atkins, British Postgraduate Medical School, Ducane Road, London, W.12.

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